

ISSUE 31, PUBLISHED 1 AUGUST 2016

ISSN 1836-5698 (Print)  
ISSN 1836-5779 (Online)

# *Australasian Journal of Herpetology*



**CONTENTS PAGE 2**

# ***Australasian Journal of Herpetology***

## **Issue 31, 1 August 2016**

### **Contents**

*Acanthophis lancasteri* Wells and Wellington, 1985 gets hit with a dose of *Crypto!* ... this is not the last word on Death Adder taxonomy and nomenclature. ... Raymond T. Hoser, 3-11.

A division of the elapid genus *Salomonelaps* McDowell, 1970 from the Solomon Islands, including the resurrection of two species and formal description of four other forms (Serpentes: Elapidae: Micropechiini: Loveridgelapina). ... Raymond T. Hoser, 21-21.

A division of the genus elapid genus *Loveridegelaps* McDowell, 1970 from the Solomon Islands, including formal description of four new species (Serpentes: Elapidae: Micropechiini: Loveridgelapina). ... Raymond T. Hoser, 22-28.

A review of the Xenodermidae and the Dragon Snake *Xenodermus javanicus* Reinhardt, 1836 species group, including the formal description of three new species, a division of *Achalinus* Peters, 1869 into two genera and *Stoliczka* Jerdon, 1870 into subgenera (Squamata; Serpentes, Alethinophidia, Xenodermidae). ... Raymond T. Hoser, 29-34.

A second new *Tropidechis* Günther, 1863 from far north Queensland (Squamata: Serpentes: Elapidae). ... Raymond T. Hoser, 35-38.

A review of the *Candoia bibroni* species complex (Squamata: Serpentes: Candoiidae: *Candoia*). ... Raymond T. Hoser, 39-61.

A new species of *Denisonia* from North-west Queensland, Australia (Serpentes: Elapidae). ... Raymond T. Hoser, 62-63.

**Cover images:** Front: Mating *Acanthophis cummingi* bred by Gordon Plumridge of Bendigo, Victoria. Back: Amelansitic *Acanthophis bottomi* bred by Andrew Gedye of Cairns, North Queensland. Photos by Raymond T. Hoser.

### ***Australasian Journal of Herpetology* ®**

Publishes original research in printed form in relation to reptiles, other fauna and related matters, including classification, ecology, public interest, legal, captivity, "academic misconduct", etc. It is a peer reviewed printed journal published in hard copy for permanent public scientific record in accordance with the *International Code of Zoological Nomenclature* (Ride *et al.* 1999), with sizeable print run and global audience.

Full details of acquiring copies, either printed or in identical form online, editorial policies, publication procedure, author submission guidelines, peer review guidelines, legal matters, advantages of publication in this journal and the like can be found by following links from:

<http://www.herp.net>

Published by Kotabi Pty Ltd  
PO Box 599  
Doncaster, Victoria, 3108.  
Australia.

Copyright. All rights reserved.

*Australasian Journal of Herpetology* is also a registered trademark ® in all relevant areas and jurisdictions (Australian trademark number: 1686575).

All Intellectual Property (IP) rights are reserved, including in relation to all IP generated by the journal in terms of both authors, publisher and the like.

Misuse of the IP by way of illegal over-writing of names formally proposed for taxa for the first timewithin this journal in accordance with relevant rules, or by any means, outside of fair and reasonable scientific discourse is strictly forbidden and legally actionable.

Online journals (this issue) do not appear for a month after the actual and listed publication date of the printed journals. Minimum print run of first printings is always at least fifty hard copies.

**ISSN 1836-5698 (Print)**  
**ISSN 1836-5779 (Online)**

# ***Acanthophis lancasteri* Wells and Wellington, 1985 gets hit with a dose of *Crypto!* ... this is not the last word on Death Adder taxonomy and nomenclature.**

RAYMOND T. HOSER

488 Park Road, Park Orchards, Victoria, 3134, Australia.

Phone: +61 3 9812 3322 Fax: 9812 3355 E-mail: snakeman (at) snakeman.com.au  
Received 6 September 2015, Accepted 8 September 2015, Published 1 August 2016.

## ABSTRACT

On the evening of Friday 28 August 2015 (East Australian time), social media was hit with a SPAM attack in the form of wide cross-posting of a PRINO (peer reviewed in name only) *Zootaxa* paper by a group known as the Wüster gang. Their online paper alleged that the taxon name *Acanthophis lancasteri* Wells and Wellington, 1985 for the Kimberley Death Adder was a *nomen nudem* and therefore not available. The paper redescribed the same species as *Acanthophis cryptamydros* Maddock *et al.*, 2015.

This paper argues that Maddock *et al.* are incorrect and that the authors have engaged in an illegal and creative interpretation of the rules of the *International Code of Zoological Nomenclature* in order to market their illegal junior synonym.

This they have reinforced by hijacking key journals and internet properties for the express purpose of peddling their warped world view on others and without allowing any dissenting views to be aired.

In fact less than six days later, a "Google" search for the term "*Acanthophis cryptamydros*" showed that the group had cross-posted their new name on no less than 3,530 different websites to cement the perception that theirs was the only correct name for the taxon.

Furthermore, other fraudulent practices by the same authors in terms of their alleged interpretations of the taxonomy and nomenclature of Death Adders (Genus *Acanthophis*: Serpentes: Elapidae) are detailed.

It is shown that similar acts of taxonomic vandalism by the same group of people with respect to the genus *Acanthophis* are almost certain.

This paper, formally accepts the division of the genus *Acanthophis* as first proposed by Wells (2002) and in turn names the third major as yet unnamed clade at the subgenus level.

There is also a note herein affirming that the name *Acanthophis groenveldi* Hoser, 2002 is in fact a junior synonym for *Acanthophis ceramensis* Günther, 1863 and the latter name is the one that should be used. Also noted is that the spellings for the species *Acanthophis cummingi* Hoser, 1998 and *Acanthophis wellsei* as first proposed by Hoser in 1998 are correct and intentional name formations.

**Keywords:** Taxonomy; snakes; nomenclature; taxonomic vandalism; *nomen nudem*; Death Adder; Elapid; *Acanthophis*; *Aggressiserpens*; *lancasteri*; *ceramensis*; *groenveldi*; *cryptamydros*; taxonomic vandalism; Wüster; Günther; Wells; Wellington; Hoser; Maddock; Gower; new subgenus; *platyelapid*.

## INTRODUCTION

As iconic Australian snakes, the Death Adders (Genus *Acanthophis* Daudin, 1803) are well known to herpetologists globally.

A detailed account of the genus of the snakes, including life history and the like can be found in Hoser (1995) and is not repeated here.

The taxonomic status of various forms have been scrutinized intensely by herpetologists in Australia ever since the genus was first described.

Numerous species have been formally described, named, and at times redescribed and renamed.

Significant recent papers on the genus and the taxonomy include those listed by Hoser (2014) and sources cited therein and they are not relisted herein.

The paper of Hoser (2014) effectively resolved the taxonomy and nomenclature of known extant species and subspecies of Death Adders, including those forms described by Hoser (1998, 2002 and 2014) as well as those of Wells and Wellington (1985) and this paper makes no alteration to that. That paper (Hoser 2014) should be read before proceeding with this paper.

However there are matters relevant to the taxonomy and nomenclature of the group not covered in that paper that are dealt with herein.

1/ The species name *Acanthophis groenveldi* Hoser, 2002 is in fact a junior synonym for *Acanthophis ceramensis* Günther, 1863 (Günther 1863) and the latter name is the one that should be used. It is most important that the correct nomenclature is used and not who is the "name authority". Unlike members of a group of thieves known as the Wüster gang (see Hoser 2012a, 2012b, 2013, 2015a-f and sources cited therein), I will not break the rules of the *International Code of Zoological Nomenclature* (Codes 2-4 as cited and referenced herein) to impose my name authority over a rightful one for personal self-gratification.

I also note herein that the spellings for the species *Acanthophis cummingi* Hoser, 1998 and *Acanthophis wellsei* as first proposed by Hoser in 1998 are correct and intentional name formations. They should not be amended in any way by any author unless absolutely mandatory under provisions of the relevant zoological code.

The two names were formed intentionally and to factor in relevant issues such as to avoid potential formation of non-homonym names.

The name *cummingi* is in honour of a female person (Fia Cumming), but her courageous actions in exposing corruption in the NSW, Australian National Parks and Wildlife Service (NPWS) took what in Australian slang was "balls" to do this, a male-type attribute. With this in mind the suffix to the name was masculinised.

For the species name *wellsei*, in honour of Richard Wells, the choice of the strict form "*wellsi*" was considered, but rejected on the basis most people would say it as "wellsey" and so a spelling broadly equating that was chosen.

In any event, I hereby act as "first reviser" as per the *International Code of Zoological Nomenclature* (Ride *et al.* 1999), and affirm the correct spellings of those names.

Beyond these statements, nothing further needs to be done within this paper in terms of these issues.

2/ Wells (2002), proposed a division of the genus *Acanthophis* along obvious morphological lines, this being the removal of the *Acanthophis pyrrhus* group and placement within a new genus he erected called *Aggressiserpens* Wells, 2002. Based on the deep phylogenetic divergence of the group from the other *Acanthophis*, the judgement of Wells has merit. However it is my considered opinion that the relevant group would be better treated as a subgenus and so this is the case herein.

This conservative judgement is made noting that to date there has been no comprehensive molecular phylogeny of *Acanthophis* as widely recognized with a comparison to other elapid genera and subgenera in order to best ascertain whether or not *Aggressiserpens* should be treated as a subgenus or full genus.

This is the same position and contention made in Hoser (2014), at page 24, where I further note that at one point in the discussion a typographical error led to *Aggressiserpens* being identified as a subspecies and not a subgenus, although elsewhere in the paper, the correct status of the name was given.

Within the ambit of a subgeneric break-up of *Acanthophis* as presently recognized, the third major lineage of Death Adders, this being the New Guinea / Indonesian group with smooth scales and reduced ventral count need also to be placed within their own subgenus and so this is done within this paper.

3/ On the evening of Friday 28 August 2015 (East Australian time), social media was hit with a SPAM attack in the form of wide cross-posting of a PRINO (peer reviewed in name only) *Zootaxa* paper by a group known as the Wüster gang. Their online paper alleged that the taxon name *Acanthophis lancasteri* Wells and Wellington, 1985 for the Kimberley Death Adder was a *nomen nudum* and therefore not available. The paper redescribed the same species as *Acanthophis cryptamydros* Maddock *et al.*, 2015.

Herein I argue that Maddock *et al.* are incorrect and that the authors have engaged in an illegal and creative interpretation of the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999) in order to market their junior synonym.

This recent publication and relevant issues are discussed after the formal description of the subgenus *Platyelapid subgen. nov.* for the smooth-scaled New Guinea Death Adders.

#### SUBGENUS PLATYELAPID SUBGEN. NOV.

**Type species:** *Acanthophis laevis* Macleay, 1877.

**Diagnosis:** The genus *Acanthophis* Daudin, 1803 are readily separated from all other elapid snakes by the fact that the tail ends in a soft terminal spine used for the purpose of caudal luring.

The subgenus *Platyelapid subgen. nov.* are readily separated from all other *Acanthophis* by the following suite of characters: Generally smooth scalation, including on the head and neck (except for some island forms which have some rugosity around the head and neck), either an absence of markings on the labials, or if present, only as spots, blotches or peppering, or alternatively the labials are mainly black; ventrals are dark at the front (near black) and light (near white) at the rear giving a distinct banded appearance, versus immaculate, peppered or only slightly (indistinctly banded in appearance) in the other two subgenera.

Most if not all *Platyelapid subgen. nov.* have a prominently raised supraciliary scale, but this trait is also seen to a lesser degree in other subgenera. While a low subcaudal count (below 115) appears to be the main character state for *Platyelapid subgen. nov.* species this is not always so.

**Distribution:** Most of island New Guinea and Islands to the west of there to Ceram and Obi, but not including the Halmahera Island complex.

**Content:** *Acanthophis (Platyelapid) laevis* Macleay, 1877 (type for the subgenus); *A. (Platyelapid) barnetti* Hoser, 1998; *A. (Platyelapid) ceramensis* Günther, 1863; *A. (Platyelapid) crotalusei* Hoser 1998; *A. (Platyelapid) macgregori* Hoser, 2002; *A. (Platyelapid) yuwoni* Hoser, 2002.

#### ACANTHOPHIS LANCASTERI WELLS AND WELLINGTON, 1985 GETS HIT WITH A DOSE OF CRYPTO!

"Crypto" is shorthand or slang among reptile keepers for the *Cryptosporidium*, a genus of protozoans that cause gastrointestinal disease and often death in snakes.

Hence the poetic license in the statement "*Acanthophis lancasteri* Wells and Wellington, 1985 gets hit with a dose of Crypto!" in view of the fact that the species name "*Acanthophis lancasteri*" has been attacked and perhaps fatally so.

That is at least the hope of the proponents of the new name.

Coincidentally the newly proposed name to replace *Acanthophis lancasteri* Wells and Wellington, 1985 is "*Acanthophis cryptamydros* Maddock *et al.* 2015".

Hence the "Crypto" line.

The sequence of events relating to the taxon, *Acanthophis lancasteri*, better known as the species of Death Adder from the Kimberley Ranges of north-west Western Australia can be summarised by the following dateline.

1985 - Wells and Wellington published the name for the species taxon in *Australian Journal of Herpetology* via what appeared to be a fairly standard, albeit brief species description.

1987 - Richard Shine as "The President, Australian Society of Herpetologists" attempted to suppress the entire contents of the relevant journal by a petition to the International Commission of Zoological Nomenclature or ICZN.

1991 - The ICZN rejected the petition by Shine and over a hundred other supporters and ruled in favour of the Wells and Wellington journal stating that the names were nomenclaturally available.

1998 - Hoser published a genus-wide revision of the Death

Adders (*Acanthophis*) and used the name *Acanthophis lancasteri* Wells and Wellington, 1985 for the relevant taxon. 1999 - Without giving a proper reason, Ken Aplin (Aplin 1999) and Aplin and Donnellan (1999) stated that *Acanthophis lancasteri* Wells and Wellington, 1985 was a *nomen nudem* and therefore not available to be used for the relevant taxon. This he repeated, but at no stage explained his position.

2001 - ICZN again ruled in favour of the Wells and Wellington journals following a second suppression attempt by Robert Sprackland, Pete Strimple and Hobart Smith.

2002 - Shea repeated the *nomen nudem* claim in an email and this was published by Hoser (2002), who while publishing the comments in a further revision of *Acanthophis*, did not take a definitive position one way or other and chose not to rename the relevant taxon (or others similarly alleged to be *nomen nudem*).

2012 - Wüster and associates circulated a petition globally (Kaiser 2012, Kaiser *et al.* 2012) seeking that herpetologists ignore the rules of the *International Code of Zoological Nomenclature* and rename taxa properly named by Hoser and Wells. This claim has been amended in 2013 (Kaiser 2013), Kaiser *et al.* 2013) and again in 2014 (Kaiser 2014a, 2014b) and most recently in 2015 (Rhodin *et al.* 2015), as detailed by Hoser (2015).

2013 - Following the urging of Wüster and associates, their friends start renaming dozens of taxa properly named by Hoser and Wells and Wellington in breach of the rules of the *International Code of Zoological Nomenclature*, usually merely citing the Kaiser *et al.* (2013) "point of view" as a veto to enable them to step outside the rules (e.g. Schleich 2014, who after recognizing *Leiopython hoseræ* Hoser, 2014 as valid for some six years chose to rename it *L. meridionalis* Schleich, 2014) in one of the most blatant attempts to steal name authority in all the history of Zoology.

2014 - Hoser published an updated revision of *Acanthophis*, naming new taxa, but following cross referencing the Wells and Wellington description/s of 1985 with the relevant parts and definitions in the *International Code of Zoological Nomenclature* (as also done in this paper), this time took the position that *Acanthophis lancasteri* Wells and Wellington, 1985 was not a *nomen nudem* according to any of editions 2-4 of the *International Code of Zoological Nomenclature* (cited herein).

2015 - On the evening of 28 August, Wolfgang Wüster and co-authors launched an internet blitz promoting their new paper in PRINO (peer reviewed in name only) *Journal Zootaxa* that alleged (without proper explanation) that *Acanthophis lancasteri* Wells and Wellington, 1985 was *nomen nudem* and that they had renamed the same taxon as *Acanthophis cryptamydros* Maddock *et al.* 2015.

While the preceding timeline sets out the sequence of events relevant to the naming and use of the taxon name *Acanthophis lancasteri*, and the associated issue of Wüster and associates seeking to steal name authority for other people's taxa, the only relevant issue in terms of *Acanthophis lancasteri* is whether or not the Wells and Wellington description of 1985 is valid according to the rules of the *International Code of Zoological Nomenclature*.

The paper Maddock *et al.* (2015) in summary remanufactured well known information about *Acanthophis* as "new" research with the simple objective of renaming *A. lancasteri*.

The relevant passage in their paper read as follows:

"The consistent differences between the Kimberley death adders and all other *Acanthophis* across three independent genetic loci, morphology, and color pattern lead us to conclude that these populations represent a separate species from all other Australian *Acanthophis*. Since the only existing name applicable to this taxon, *Acanthophis lancasteri* Wells and Wellington, 1985, is a *nomen nudum* (Aplin and Donnellan 1999), we describe it as a new species below, diagnosing it from its congeners and all other currently recognized Australian

*Acanthophis* species."

This leads one directly to the paper of Aplin and Donnellan (1999), which clearly most readers of Maddock *et al.* (2015) would not do, but I in fact did.

The relevant passage in Aplin and Donnellan (1999) read as follows:

"The nomenclature of *Acanthophis* has been impacted by two works published by 'amateur' herpetologists in unrefereed contexts. Wells and Wellington (1985) proposed four additional species of *Acanthophis* in their essentially self-published "Classification of the Amphibia and Reptilia of Australia". Three of these proposed taxa (*armstrongi*, *lancasteri*, *schistos*) were based solely on Storr's (1981) figures and descriptions of each of the three Western Australian populations; these are *nomina nuda* because they do not include or point to previously published differential diagnoses. The fourth Wells and Wellington name, *A. hawkei*, proposed for the 'Barkly Adder', minimally satisfies the conditions for 'availability' as set out by the *International Code of Zoological Nomenclature* (1985). However, the taxon has not been adequately diagnosed and for the present is best treated as a junior synonym of *A. antarcticus*."

The relevant statement herein is:

"these are *nomina nuda* because they do not include or point to previously published differential diagnoses."

This brings us to the "International Code of Zoological Nomenclature (1985)" as cited by Aplin for an explanation, which I might add is highly unlikely to be consulted by a casual reader of Maddock *et al.* (2015).

The terms *nomen nudem*, or the plural *nomina nuda* are defined in the relevant codes, and in the current, fourth edition the following is written:

"The provisions of this Code supersede those of the previous editions with effect from 1 January 2000 ...

*nomen nudum* (pl. *nomina nuda*), n.

A Latin term referring to a name that, if published before 1931, fails to conform to Article 12; or, if published after 1930, fails to conform to Article 13. A *nomen nudum* is not an available name, and therefore the same name may be made available later for the same or a different concept; in such a case it would take authorship and date [Arts. 50, 21] from that act of establishment, not from any earlier publication as a *nomen nudum*."

The preceding leads us to Article 13 of the Code, and here the audit becomes more interesting as there are potentially three issues of the Code to deal with.

At the time of the publication of the Wells and Wellington paper, the second edition of the code was in force. The third edition carried a publication date of February 1985, but it was not actually printed until 1988 based on date stamps on library copies, including that posted online by the Smithsonian in the USA.

The fourth edition, published in 1999, has an explicit statement that it supersedes the rest in any event.

However Article 13 is much the same in each code.

So there can be no doubt as to what is said in each edition, I copy them in full below:

#### Code 2nd Edition 1964

"Article 13

Article 13. Names published after 1930.

(a) Names in general.

In addition to satisfying the provisions of Article 11, a name published after 1930 must either be:

(i) accompanied by a statement that purports to give characters differentiating the taxon; or

(ii) accompanied by a definite bibliographic reference to such a statement; or

(iii) proposed expressly as a replacement for a pre-existing available name.

(b) Genus-group names. A genus-group name published after 1930 must, in addition to satisfying the provisions of Section (a), be accompanied by the definite fixation of a type-species [Art. 68].”

#### Code 3rd Edition 1985 (1988)

“Article 13. Names published after 1930.

(a) Requirements.

To be available, every new scientific name published after 1930 must satisfy the provisions of Article 11, and must be:

(i) **accompanied by a description or definition that states in words characters that are purported to differentiate the taxon**, or

(ii) accompanied by a bibliographic reference to such a published statement even if contained in a work published before 1758 or that is not consistently binominal (for information excluded for reasons of anonymity after 1950 see Article 14), or

(iii) proposed expressly as a new replacement name (*nomen novum*) for an available name.

**Recommendation 13A. Comparisons.**—In describing a new nominal taxon, an author should make his intention to differentiate clear to others by giving a summary of characters that in the author’s opinion differentiate the taxon from other named taxa of the same rank as the new taxon.

(b) Genus-group names.—Every new genus-group name published after 1930 (but not a name published at any time for a collective group or an ichnotaxon [Art. 66]) must, in addition to satisfying the provisions of Section a of this Article, be accompanied by the fixation of a type species for that nominal genus-group taxon by original designation [Art. 68b] or by indication [Arts 67h, 68c-e].

(i) If the name of a genus-group taxon established before 1931 is replaced after 1930, the type species of that nominal taxon must then be designated, if that has not already been done.”

#### Code 4th Edition 1999 (2000)

“Article 13. Names published after 1930.

13.1. Requirements. To be available, every new name published after 1930 must satisfy the provisions of Article 11 and must

13.1.1. **be accompanied by a description or definition that states in words characters that are purported to differentiate the taxon**, or

13.1.2. be accompanied by a bibliographic reference to such a published statement, even if the statement is contained in a work published before 1758, or in one that is not consistently binominal, or in one that has been suppressed by the Commission (unless the Commission has ruled that the work is to be treated as not having been published [Art. 8.7]), or

13.1.3. be proposed expressly as a new replacement name (*nomen novum*) for an available name, whether required by any provision of the Code or not.

**Recommendation 13A. Intent to differentiate.** When describing a new nominal taxon, an author should make clear his or her purpose to differentiate the taxon by including with it a diagnosis, that is to say, a summary of the characters that differentiate the new nominal taxon from related or similar taxa.

**Recommendation 13B. Language.** Authors should publish diagnoses of new taxa in languages widely used internationally in zoology. The diagnoses should also be given in languages used in the regions relevant to the taxa diagnosed.”

#### ICZN Code Edition

##### Proposed New Name Requirements

##### Code 2nd Edition 1964

“accompanied by a statement that purports to give characters differentiating the taxon”

##### Code 3rd Edition 1985 (1988)

“accompanied by a description or definition that states in

words characters that are purported to differentiate the taxon”

##### Code 4th Edition 1999 (2000)

“accompanied by a description or definition that states in words characters that are purported to differentiate the taxon”

The significant part of each section, never quoted by either Aplin and Donnellan (1991) or of course Maddock *et al.* (2015), summarised in the table immediately above is the use of the word “purports” or “purported”.

The word purport is not defined in any edition of the code, but it is in most dictionaries and online as well, where on 3 September 2015 Google defined it as follows:

“appear to be or do something, especially falsely.”

In other words, even if the Wells and Wellington description for *Acanthophis lancasteri* pointed to a document that did not carry a description or diagnosis, the mere fact their description purported this, means that it is valid under any of the three relevant editions of the code.

Now just to remove any doubt at all as to the nomenclatural availability of *Acanthophis lancasteri* and that the original description did “purport” to “differentiate the taxon” (Code edition 3), I copy the description in its entirety within this paper.

Elsewhere within a separate as yet unpublished paper, Ross Wellington summed up the situation when he wrote:

“By any reasonable objective interpretation of the Code Rule in relation to the description of *Acanthophis lancasteri* Wells and Wellington 1985, it is described. The ICZN (1991) has ruled that Wells and Wellington 1984 and 1985 are publications and are available for nomenclatural purposes. The description for *Acanthophis lancasteri* does provide a Holotype WAM R70690 from a Type locality of 45 km NNE of Halls Creek, WA. Also in accordance with the above Article 13 and in contradiction to Aplin (1999); Aplin and Donnellan (1999) and by implication also Maddock, Ellis, Doughty, Smith, and Wüster (2015) who relied upon Aplin’s (and Donnellan) incorrect assertions, the description of *Acanthophis lancasteri* in fact does provide a statement that purports to show difference between the then new species and other species in the *Acanthophis* complex, it also provides further information, other references and to defined published source information in support of the purported difference statement. For example it also provides further interpolative information in the description of *Acanthophis hawkei* (same paper) as well as in the references section. The W&W description demonstrates, unequivocally the entity to which the description applies. As with any description additional information could have been provided but the description, although brief, as it stands did conform to the minimum requirements (then required) of a valid description and hence is available.”

Wells and Wellington (1999) also published a direct rebuttal to Aplin (1999) and his claims against their taxon *Acanthophis lancasteri*, but this was evidently deliberately ignored by Wüster and his gang.

In other words *Acanthophis lancasteri* is available for the taxon and is the name that must be used.

*Acanthophis cryptamydros* Maddock *et al.* 2015 is merely a junior synonym of the former and should not be used.

#### BAD MOTIVE ON THE PART OF MADDOCK AND WÜSTER.

Of course one needs evidence to assert such a thing. After all, one may assume for a moment that Maddock *et al.* published their incorrect assessment of the nomenclatural validity of *Acanthophis lancasteri* due to a human error or inadvertent failure to check the relevant parts of the *International Code of Zoological Nomenclature*.

That we know this is not the case and that they have acted at all times with improper motive comes from the mouth of Maddock himself (Proud 2015).

On the website at:

<http://www.nhm.ac.uk/our-science/science-news/2015/august/new-highly-venomous-snake-species-discovered-in-australia.html>

with a posting date of 28 August 2015, is the statement:

"A team led by a Natural History Museum scientist has discovered a new species of highly venomous Australian death adder in the Kimberley region of the country."

and

"The team, which included researchers from Bangor University and the Western Australian Museum, identified the new species while researching the genetics and ecological characteristics of snakes living in the Kimberley region."

We know these statements to be false because even back in 1985 when Wells and Wellington first formally named (discovered?) the same species, it was well known in Australia and I had also caught and kept them for some years prior to that date!

Now noting I had confirmed the existence of the species "discovered" by Wells and Wellington in 1985 in my papers in 1998, 2002 and again in 2014, (not that Wells and Wellington ever had the audacity to claim they were the ones who first discovered them), the claim by Maddock, Wüster and their gang to have discovered this species must be patently false!

So not only have Maddock *et al.* misrepresented the provisions of the *International Code of Zoological Nomenclature* to steal "name authority" for a species of snake, but then they have publicly lied about their claim to have "discovered a new species of highly venomous Australian death adder in the Kimberley region of the country".

#### HOW THEN DID THE PAPER OF MADDOCK ET AL. (2015) GET PUBLISHED?

*Zootaxa* alleges it is a "peer reviewed" scientific journal.

Hoser (2015d) and sources cited therein give numerous examples of evidence to show that *Zootaxa* has never had anything resembling a proper peer review quality control system in place.

In fact *Zootaxa* is a holotype PRINO (peer reviewed in name only) journal.

However this paper deals specifically with Maddock *et al.* (2015) and it is here I point out the obvious failings.

Had there been proper quality control, the reviewers would have followed the simple intellectual exercise I have now done several times in order to ascertain the legal availability of the name *Acanthophis lancasteri*.

With the entire substantive basis of Maddock *et al.* (2015) being to rename the taxon (the rest of the paper's text is effective padding for that), had a reviewer done the relevant exercise of cross-checking they'd have found that the name *Acanthophis lancasteri* was nomenclaturally available and rejected the Maddock *et al.* paper.

So it becomes relevant as to who actually edited and reviewed the paper at *Zootaxa*.

First we deal with the listed authors.

Maddock, until now effectively unknown in herpetology, turns out to be a recently graduated student of University lecturer Wolfgang Wüster at Bangor University, Wales, UK.

He now has a position at the Natural History Museum in London, UK.

We know all this from his website at:

<http://www.ucl.ac.uk/~ucbtjtd/Site/Simon.html>

On that webpage he states:

"Simon graduated from the University of Wales, Bangor with a Master of Zoology in 2011."

That confirms Wüster was his teacher and a close associate.

The webpage further states:

"Currently Simon is working towards his PhD, which is joint between UCL and the Natural History Museum, London

(supervisor Dr David Gower)"

Now who is David Gower?

A quick search on "Google" shows he is listed as an editor at the PRINO journal *Zootaxa*!

So there you have it!

Wüster and an ex-student conspire to steal name rights for a species and then have their paper published in a journal where a co-worker Gower, who works with Maddock is able to bypass any credible quality control.

Nowhere in the relevant Maddock *et al.* paper is this critically important conflict of interest disclosed.

Now this of course doesn't explain the role of the other listed co-authors, but this is easily ascertained.

Ryan J. Ellis works with Wüster at Bangor University and plays a key role in creating the spiffy looking graphics you see in his papers, so in gratitude, Wüster has him listed as a co-author.

The other two authors, Paul Doughty and Laurie Smith, employed at the Western Australian Museum have long been at loggerheads with Wells and Wellington, including in the failed attempt to have the relevant publication suppressed by the ICZN in the 1980's and 1990's.

Smith also described a species of python from Western Australia calling it "*Liasis stimsoni*". The problem for him was that it was a junior synonym for *Antaresia saxacola* Wells and Wellington, 1985, named some months earlier.

In order to discourage usage of the correct Wells and Wellington name, Smith and others at the Western Australian Museum actively supported the push to suppress the Wells and Wellington publications of 1984 and 1985 while simultaneously aggressively marketing his own name on the basis that the attempted suppression of Wells and Wellington's would succeed.

By the time this suppression attempt failed in 1991, Smith's name was already in widespread usage, while the Wells and Wellington one effectively unused.

After I corrected this anomaly in Hoser (2000), and expecting others to follow the logical and correct course of using the correct senior synonym, a new claim was erected to allege that the Wells and Wellington name "*saxacola*" was "*nomen nudum*", which from any cross referencing of the description with any edition of the *International Code of Zoological Nomenclature* (editions 2-4) is clearly not the case.

I also note that it is obvious that few if any lay people would have the inclination or capacity to do this, noting that in year 2000, the Code was not available online and hard copies relatively rare outside of natural history museums.

Hence it would not come as a surprise to find that these men would jump at the chance to be listed as coauthors in a paper that had them steal yet another west Australian species name from Wells and Wellington.

Plus of course they supplied the holotype for the allegedly "new" species.

#### WHY THIS IS NOT THE LAST WORD ON DEATH ADDER TAXONOMY AND NOMENCLATURE!

Wüster and his gang have access to modern molecular methods to assist in ascertaining relationships between taxa. Maddock *et al.* (2015) has used molecular data to "validate" their taxonomic conclusion that they are naming a new species (ignoring the fact that buried in the text of their paper is an oblique statement to the effect they are stealing "name authority" from Wells and Wellington.

However there are some key facts worth noting in all this.

Large charismatic vertebrates, including Death Adders do not need the services of molecular biologists to work out which species is which.

They are easily delineated by simply looking at the snakes themselves.

The same is the case for other species such as White-lipped Pythons (genus *Leiopython*), which is another group the Wüster gang have tackled with their taxonomic vandalism and nomenclatural misconduct along with selective use and non-use of molecular data (see Hoser 2009).

In the molecular results published by Maddock *et al.*, the authors have conveniently omitted to show any molecular data that validated taxa named by myself, even though they had such material available. This included specimen data for either described subspecies of *Acanthophis wellsei*, namely *A. wellsei hoseerae* Hoser, 2014 and *A. wellsei donnellani* Hoser, 2002, or the northern New Guinea taxa, *Acanthophis barnetti* Hoser, 1998 and *A. crotalusei* Hoser, 1998.

Of course there has been published molecular data for species groups with parallel distributions to these taxa and all have validated the obvious species divisions.

Wüster of course has been playing mental gymnastics for years to avoid having to recognize any taxa formally named by myself and this involves some ridiculous propositions, including that *A. barnetti* and *A. crotalusei* are merely variants of *A. laevis*. As of 3 September 2015, on Peter Uetz's "The Reptile Database" which Wüster effectively controls in materially relevant ways, one sees for the entry for "*Acanthophis wellsi* Hoser, 1998" (sic), the following text: "Synonymy: Not listed by COGGER 2000. The name was emended to *wellsi* as the species was described in honor of Richard Wells. *Acanthophis wellsi donnellani* HOSER 2002 may be a synonym of *A. wellsi* (WÜSTER, pers. comm. 15 Dec 2010)."

Of course material Wüster and co-authors themselves had on hand that they should have published in Maddock *et al.* could have easily refuted his bogus claim that "*Acanthophis wellsi donnellani* HOSER 2002 may be a synonym of *A. wellsi*".

It is also worth mentioning that Cogger (2014) did in fact recognize *A. wellsei* (spelt properly I might add) a fact Wüster and sidekick Uetz have conveniently chosen to ignore.

Significant however is that without so much as a statement that he had been lying about *Acanthophis wellsei* and its alleged synonymy with *A. pyrhus* Boulenger, 1898 for the previous 17 years, the coauthor Wüster accepts and uses the name "*A. wellsi*" (sic) for a taxon he (now) regards as valid in Maddock *et al.* (2015).

There is also the issue of the molecular data Maddock *et al.* present for *A. wellsei* in their paper on page 306. Data from snakes from three different locations is shown, implying all are the same species and with minimal divergence between the samples.

The number of course matches the three forms I have described (in 1998, 2002 and 2014).

What is not readily disclosed and only becomes clear when the named localities are plotted against a map is that all come from the main range of the nominate subspecies of *A. wellsei* and that none of the samples include the more recently described subspecies.

Wüster assisted his mate Wulf Schleip in 2008 when he published his paper on *Leiopython* which produced molecular evidence to confirm the obvious fact that those from south of the New Guinea central range were a different species to those from the north.

(Significant that time was that they did not publish molecular data they had obtained showing all the brown *Leiopython* from north of the central range were one and the same species, with Schleip claiming in the paper and ever since to have "discovered" several new species).

Noting that the barrier affecting those snakes is the same as for Death Adders, even before one inspects the very different snakes from north and south of the range, it is clear that the *Acanthophis* from each side are different species.

Rather than producing material and data that they had available to them, that confirms the validity of the species *Acanthophis barnetti* Hoser, 1998, and using the correct nomenclature, Maddock *et al.* chose to withhold such information.

However it was posted on Facebook in the week following the publication of Maddock *et al.*, that the same authors were plotting ways they could try to steal name authority for that taxon as well.

Hence we know that Maddock *et al.* is not the last word from the Wüster gang on Death Adder taxonomy.

#### DEALING WITH THE CRYPTO INFECTION!

Within hours of Wüster and his gang posting and promoting links to his co-authored paper on "Facebook" on Friday 28 August 2015 (east Australian time), Wells had published an extensive rebuttal of the claims in the 2015 paper on Facebook which was read and answered by both Maddock and Wüster.

They ignored this and continued to peddle their new name and paper, as if it were the unimpeachable gospel.

However the reach of Wüster and his gang in peddling their lies and falsehoods was best demonstrated when less than six days later in the morning of 3 September 2015 (east Australian time), I did a "Google" search for *Acanthophis cryptamydros*.

It showed that the group had cross-posted their new name on no less than 3,530 different websites to cement the perception that theirs was the only correct name for the taxon and that they had discovered the species themselves.

By contrast the valid name (*lancasteri*) was shown on only half that number of webpages, even though it had been around for 30 years!

This is perhaps the most stark example of extremist taxonomic vandalism and nomenclatural misconduct and the power of reach by those who engage in these activities, seen to date in the age of internet and rapid dissemination of information, both incorrect and correct.

It shows how by use of social media including via the dark art of Search Engine Optimisation (SEO), hijacking sites like Wikipedia (also attacked by Wüster's gang within hours of their paper coming out) altered to reflect their warped dreams of total hegemony in terms of reptile taxonomy and nomenclature, the group can and does dupe people into believing that their illegal minority view is in fact correct and consensus in methods accurately detailed by Dubois (2015).

Contrary to various claims made, I have no vested interest in Wells, Wellington or their taxonomy and nomenclature.

My only concerns are with the science and the rules of engagement, these being published in the *International Code of Zoological Nomenclature*.

If and when Wells and Wellington get things right, I support them. If they get it wrong I condemn them, or I don't agree with them, I deal with that appropriately.

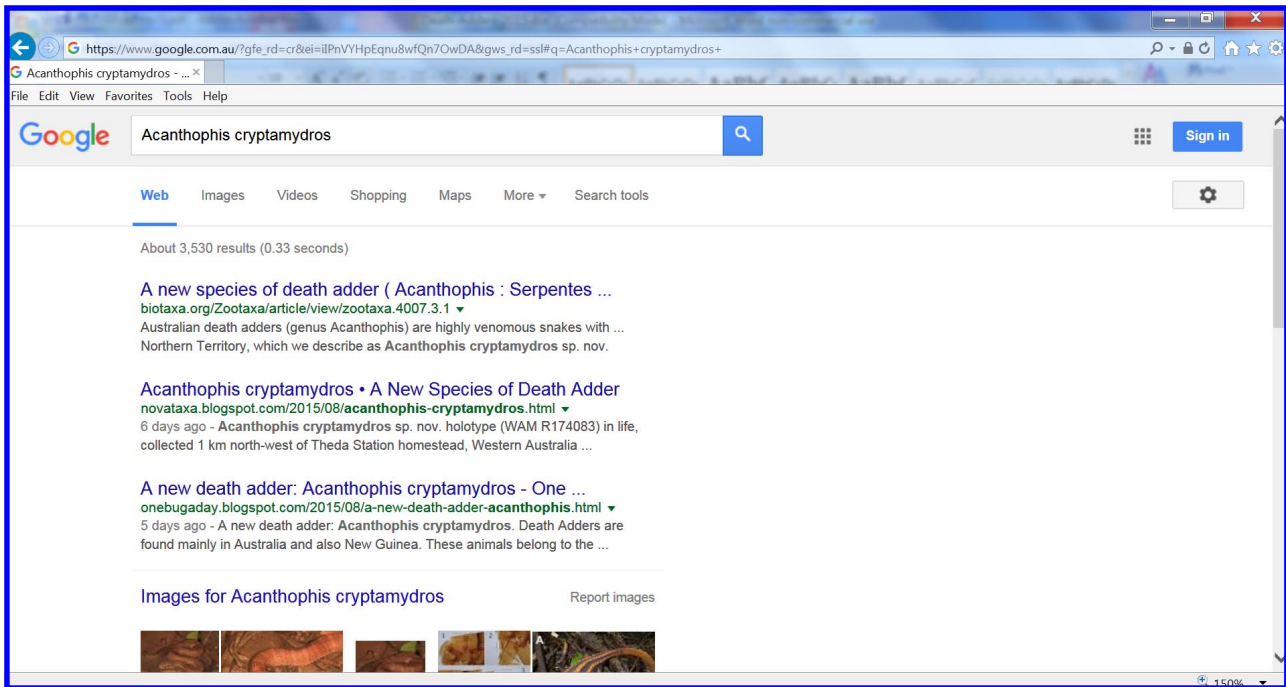
While it is easy to identify defects in the description *Acanthophis lancasteri*, (my view is it is lousy), the fact remains it complied with the rules of the Code and also was typical of others of the time (1980's and earlier), and in fairness to the authors should be viewed in that context.

As seen many times past, Wüster and his gang have more time and internet savvy than their opponents.

They have hijacked control of key internet properties such as "Wikipedia" and "The Reptile Database" to peddle their distorted world views. In the offline world, their group has hijacked editorial influence in several formerly well-regarded scientific journals in order to bypass proper peer review to get their material published as fast as they write it.

As seen by the many examples published in Hoser (2012a, 2012b, 2013, 2015a-f) and sources cited therein, Wüster and his gang of thieves will not voluntarily stop their attack on the rules of the *International code of Zoological Nomenclature* in order to

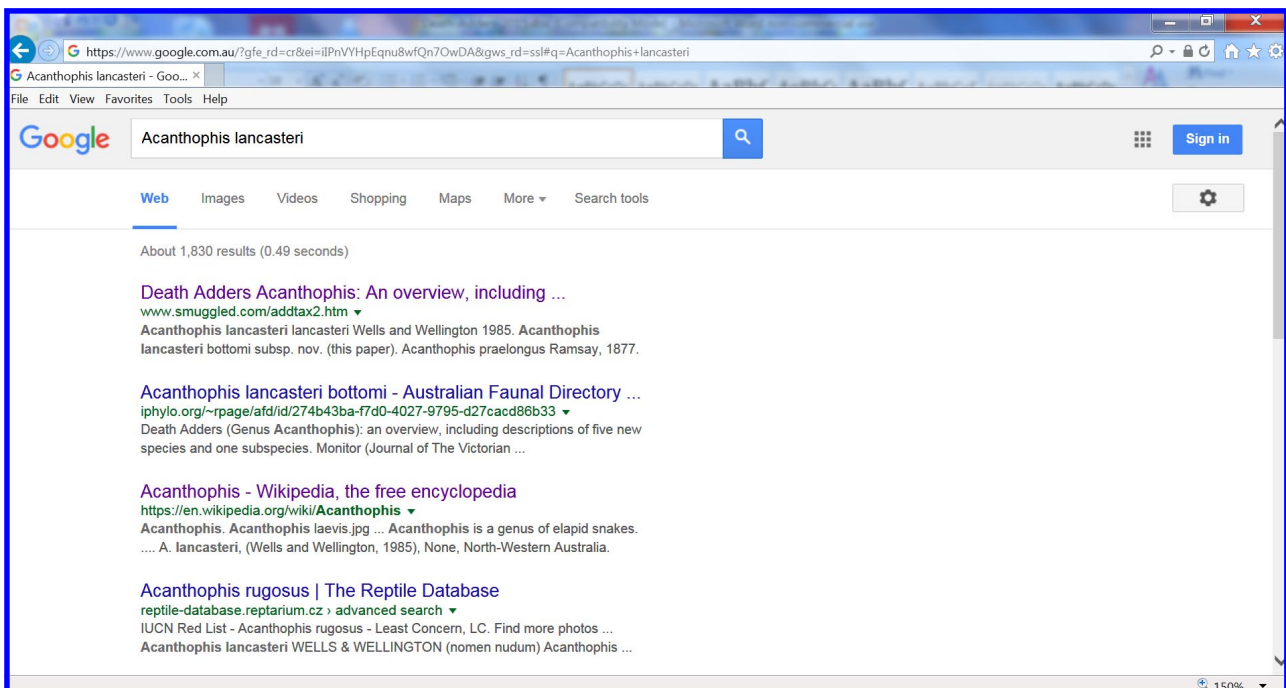




**Never letting the truth get in the way of their lie ...**

Within days, Wolfgang Wüster and his band of thieves had plastered their illegal name *Acanthophis cryptamydros* all over the internet to swamp the correct name *Acanthophis lancesteri*. This was in order to convince the world that they had indeed discovered a new species and that their name was the correct one. This is seen by the number of online uses via a Google search on 3 September 2015.

Hoser 2016 - Australasian Journal of Herpetology 31:3-11.



steal name authority for names from authors everywhere. Perhaps the best to make this potentially happen is via a strongly worded ruling by the ICZN against nomenclatural misconduct by the Wüster gang or like-minded individuals.

Victims of the gang include myself, who have been falsely accused of stealing the work of others (only they have done that) and this problem, real or perceived needs to be dealt with.

In fact the actions of the Wüster gang and like-minded individuals has created a ridiculous situation whereby scientists are wasting an inordinate amount of time arguing over name authority for taxa that was properly named long ago, while thieves try to creatively interpret the rules and steal yet more validly named taxon "name authority" from others. This is all happening when scientists should be more properly dealing with the science of taxonomy and describing biodiversity before it is killed off by the human population explosion.

However the problem of name authority disputes can in fact be easily solved via a revamped system of establishing availability of names in Zoological Nomenclature.

New names could be registered in a similar manner to that used worldwide for trademark registration.

Via an automated online system, new names could be submitted (at the time the scientist first seeks to potentially name taxa) with a time limit imposed to publish a paper formally describing the taxon or taxa and satisfy the relevant code requirements (the code currently recommends a year and that could be made mandatory). The publication is then also submitted and checked for form by an examiner against the rules of the Code as is done for trademarks.

They check against a trademarks registration manual.

In line with the current rules, the ICZN would restrict its ambit to nomenclature and not taxonomy.

A fee could be imposed to cover the costs of the system, with fee waiver provisions for those unable to pay.

In fact the ICZN could even run the system at a profit to cover the ongoing administration costs of the entity.

As with trademark registrations, there could be an "opposition" period, whereby people opposing registration could lodge objections (subject to the rules) and argue their cases, with the ICZN making a decision one way or other and before the name even becomes "legal".

As with trademarks, the names can be used pending registration or non-registration, with registration back-dated to application or other specified date after registration takes place.

In line with trademarks, non registration of a name would mean it could not be used as intended.

All this would limit the ongoing instability created by the use or non-use of names some people assert are not code-compliant and would have prevented or resolved such issues like the validity of *Acanthophis lancasteri*, at the time it was proposed and not 30 years later and with the full-blown intervention of the ICZN commissioners themselves.

If necessary a limit system could be used to prevent persons or groups monopolizing taxa, making ambit claims or in any way unfairly preventing others from using the system.

Such a system would accurately identify who first publicly identified themselves as working on given taxa, thereby enabling accusations of theft of work or ideas to be easily checked and refuted or accepted.

A system of name registration similar to that employed by trademarks offices worldwide, including those nations signatory to the Madrid protocol would not only significantly improve the nomenclature system for new names of taxa, but also reduce the unnecessary dispute resolving workload of scientists and ICZN Commissioners alike.

In fact, the ICZN would no longer have to regularly deal with cases of thieves trying to steal the work of others as has become common in recent years due to the actions of Wüster

and his gang of thieves. Then the ICZN commissioners themselves could spend more time dealing with their real passion, that being taxonomy!

#### REFERENCES CITED

- Aplin, K. P. 1999. Amateur Taxonomy in Australian Herpetology - Help or hindrance? *Monitor - Journal of the Victorian Herpetological Society* 10(2/3):104-109.
- Aplin, K. P. and Donnellan S. C. 1999. An extended description of the Pilbara Death Adder, *Acanthophis wellsii* Hoser (Serpentes: Elapidae), with notes on the Desert Death Adder, *A. pyrrhus* Boulenger, and identification of a possible hybrid zone. *Records of the Western Australian Museum* 19:277-298.
- Cogger, H. G. 2014. *Reptiles and Amphibians of Australia* (Seventh edition), CSIRO. Sydney, Australia:1064 pp.
- Daudin, F. M. 1802. *Histoire Naturelle, Générale et Particulière des Reptiles*, Vol. 4. F. Dufart, Paris.
- Dubois, A. 2015. Zoological nomina in the century of extinctions: new proposals. *Bionomina*, 8:11-53.
- Günther, A. 1863. Contribution to the herpetology of Ceram. *Proc. Zool. Soc. London* 1863:58-60.
- Hoser, R. T. 1995. Australia's Death Adders, Genus *Acanthophis*, *The Reptilian* 3(4):7-21 and cover, 3 (5):27-34.
- Hoser, R. T. 1998. Death Adders (Genus *Acanthophis*): An overview, including descriptions of Five new species and One subspecies. *Monitor: Journal of the Victorian Herpetological Society* 9(2):20-41.
- Hoser, R. T. 2002. Death Adders (Genus *Acanthophis*): An Updated overview, including descriptions of 3 New Island species and 2 New Australian subspecies. *Crocodylian: Journal of the Victorian Association of Amateur Herpetologists* September 2002:5-11,16-22,24-30, front and back covers.
- Hoser, R. T. 2009. Creationism and contrived science: A review of recent python systematics papers and the resolution of issues of taxonomy and nomenclature. *Australasian Journal of Herpetology* 2:1-34.
- Hoser, R. T. 2012a. Exposing a Fraud! *Afronaja* Wallach, Wüster and Broadley 2009, is a junior synonym of *Spracklandus* Hoser 2009! *Australasian Journal of Herpetology* 9:1-64.
- Hoser, R. T. 2012b. Robust taxonomy and nomenclature based on good science escapes harsh fact-based criticism, but remains unable to escape an attack of lies and deception. *Australasian Journal of Herpetology* 14:37-64.
- Hoser, R. T. 2013. The science of herpetology is built on evidence, ethics, quality publications and strict compliance with the rules of nomenclature. *Australasian Journal of Herpetology* 18:2-79.
- Hoser, R. T. 2014. Tidying up Death Adder taxonomy (Serpentes: Elapidae: *Acanthophis*): including descriptions of new subspecies and the first ever key to identify all recognized species and subspecies within the genus. *Australasian Journal of Herpetology* 23:22-34.
- Hoser, R. T. 2015a. Dealing with the "truth haters" ... a summary! Introduction to Issues 25 and 26 of *Australasian Journal of Herpetology*. Including "A timeline of relevant key publishing and other events relevant to Wolfgang Wüster and his gang of thieves." and a "Synonyms list". *Australasian Journal of Herpetology* 25:3-13.
- Hoser, R. T. 2015b. The Wüster gang and their proposed "Taxon Filter": How they are knowingly publishing false information, recklessly engaging in taxonomic vandalism and directly attacking the rules and stability of zoological nomenclature. *Australasian Journal of Herpetology* 25:14-38.
- Hoser, R. T. 2015c. Best Practices in herpetology: Hinrich Kaiser's claims are unsubstantiated. *Australasian Journal of Herpetology* 25:39-52.
- Hoser, R. T. 2015d. PRINO (Peer reviewed in name only) journals: When quality control in scientific publications fails.

*Australasian Journal of Herpetology* 26:3-64.

Hoser, R. T. 2015e. Comments on *Spracklandus* Hoser, 2009 (Reptilia, Serpentes, ELAPIDAE): request for confirmation of the availability of the generic name and for the nomenclatorial validation of the journal in which it was published (Case 3601; see *BZN* 70: 234-237; comments *BZN* 71:30-38, 133-135). (Unedited version) *Australasian Journal of Herpetology* 27:37-42.

Hoser, R. T. 2015f. Rhodin *et al.* 2015, Yet more lies, misrepresentations and falsehoods by a band of thieves intent on stealing credit for the scientific works of others. *Australasian Journal of Herpetology* 27:3-36.

ICZN 1991. Three works by Richard W. Wells and C. Ross Wellington: proposed suppression for nomenclatorial purposes. *Bulletin of Zoological Nomenclature* 48(4): 337-338.

Kaiser, H. 2012. SPAM email sent out to numerous recipients on 5 June 2012.

Kaiser, H. *et al.* 2012. *Point of view*. Hate article sent as attachment with SPAM email sent out on 5 June 2012.

Kaiser, H. 2013. The Taxon Filter, a novel mechanism designed to facilitate the relationship between taxonomy and nomenclature, vis-à-vis the utility of the Code's Article 81 (the Commission's plenary power). *Bulletin of Zoological Nomenclature* 70(4) December 2013:293-302.

Kaiser, H. 2014a. Comments on *Spracklandus* Hoser, 2009 (Reptilia, Serpentes, ELAPIDAE): request for confirmation of the availability of the generic name and for the nomenclatorial validation of the journal in which it was published (Case 3601; see *BZN* 70: 234-237). *Bulletin of Zoological Nomenclature* 71(1):30-35.

Kaiser, H. 2014b. Best Practices in Herpetological Taxonomy: Errata and Addenda. *Herpetological Review*, 45(2):257-268.

Kaiser, H., Crother, B. L., Kelly, C. M. R., Luiselli, L., O'Shea, M., Ota, H., Passos, P., Schleip, W. D. and Wüster, W. 2013. Best practices: In the 21st Century, Taxonomic Decisions in Herpetology are Acceptable Only When supported by a body of Evidence and Published via Peer-Review. *Herpetological Review* 44(1):8-23.

Maddock, S. T. 2015. Webpage blog at: <http://www.ucl.ac.uk/~ucbtjtd/Site/Simon.html>

Maddock, S. T., Ellis, R. J., Doughty, P., Smith, L. A. and Wüster, W. 2015. A new species of death adder (*Acanthophis*: Serpentes: Elapidae) from north-western Australia. *Zootaxa* 4007(3):301-326 online.

Proud, L. 2015. New highly venomous snake species discovered in Australia. Post on internet at: <http://www.nhm.ac.uk/our-science/science-news/2015/august/new-highly-venomous-snake-species-discovered-in-australia.html>

Ride, W. D. L. (ed.) *et al.* (on behalf of the International Commission on Zoological Nomenclature) 1985. *International code of Zoological Nomenclature* (Third edition). The Natural

History Museum - Cromwell Road, London SW7 5BD, UK (also commonly cited as "The Rules", "Zoological Rules" or "ICZN 1985") (the document appears to have been first printed in 1988 based on a receipt from the Smithsonian Library stamped on their online pdf of the document).

Ride, W. D. L. (ed.) *et al.* (on behalf of the International Commission on Zoological Nomenclature) 1999. *International code of Zoological Nomenclature* (Fourth edition). The Natural History Museum - Cromwell Road, London SW7 5BD, UK (also commonly cited as "The Rules", "Zoological Rules" or "ICZN 1999").

Stoll, N. R. (ed.) *et al.* (on behalf of the International Commission on Zoological Nomenclature) 1964. *International code of Zoological Nomenclature* (Second edition). The Natural History Museum - Cromwell Road, London SW7 5BD, UK (also commonly cited as "The Rules", "Zoological Rules" or "ICZN 1964").

Wells, R. W. 2002. Taxonomy of the Genus *Acanthophis* (Reptilia: Elapidae) in Australia. *Australian Biodiversity Record* 2002(5)(March):18.

Rhodin, A. *et al.* (70 listed authors) 2015. Comment on *Spracklandus* Hoser, 2009 (Reptilia, Serpentes, ELAPIDAE): request for confirmation of the availability of the generic name and for the nomenclatorial validation of the journal in which it was published (Case 3601; see *BZN* 70: 234-237; 71: 30-38, 133-135, 181-182, 252-253). *Bulletin of Zoological Nomenclature* 72(1):65-78.

Schleip, W. D. 2008. Revision of the Genus *Leiopython* Hubrecht 1879 (Serpentes: Pythonidae) with the Redescription of Taxa Recently Described by Hoser (2000) and the Description of New Species. *Journal of Herpetology* 42(4):645-667.

Schleip, W. D. 2014b. Two new species of *Leiopython* Hubrecht (sic), 1879 (Pythonidae: Serpentes): Non-compliance with the International Code of Zoological Nomenclature leads to unavailable names in zoological nomenclature. *Journal of Herpetology* 48(2):272-275.

Wells, R. W. and Wellington, C. R. 1984. A synopsis of the class Reptilia in Australia. *Aust. Journal of Herpetology* 1(3-4):73-129.

Wells, R. W. and C. R. Wellington. 1985. A classification of the Amphibia and Reptilia of Australia. *Australian Journal of Herpetology Supplementary Series* 1:1-61.

Wells, R. W. and Wellington, C. R. 1999. A response to Ken Aplin's article on Herpetology in Australia. *Monitor: Journal of the Victorian Herpetological Society* 10(2/3):110-112.

Wüster, W., Broadley, D. G. and Wallach, V. 2014. Comments on *Spracklandus* Hoser, 2009 (Reptilia, Serpentes, ELAPIDAE): request for confirmation of the availability of the generic name and for the nomenclatorial validation of the journal in which it was published (Case 3601; see *BZN* 70: 234-237). *Bulletin of Zoological Nomenclature* 71(1):37-38.

#### CONFLICT OF INTEREST

The author has no relevant conflicts of interest.

### **Australasian Journal of Herpetology**®

Publishes original research in printed form in relation to reptiles, other fauna and related matters, including the subjects of classification, ecology, public interest, captivity, "academic misconduct", etc. It is a peer reviewed printed journal published in hard copy for permanent public scientific record in accordance with the *International Code of Zoological Nomenclature* (Ride *et al.* 1999), with a sizeable print run and has a global audience.

Full details of acquiring copies, either printed or in identical form online, editorial policies, publication procedure, author submission guidelines, peer review guidelines, legal matters, advantages of publication in this journal and the like can be found by following links from:

<http://www.herp.net>

Published by Kotabi Pty Ltd  
PO Box 599  
Doncaster, Victoria, 3108.  
Australia.

Copyright. All rights reserved.

Online journals (this issue) do not appear for a month after the actual and listed publication date of the printed journals. Minimum print run of first printings is always at least fifty hard copies.

ISSN 1836-5698 (Print)  
ISSN 1836-5779 (Online)

**A division of the elapid genus *Salomonelaps* McDowell, 1970 from the Solomon Islands, including the resurrection of two species and formal description of four other forms (Serpentes: Elapidae: Micropechiini: Loveridgelapina).**

**RAYMOND T. HOSER**

488 Park Road, Park Orchards, Victoria, 3134, Australia.

Phone: +61 3 9812 3322 Fax: 9812 3355 E-mail: snakeman (at) snakeman.com.au

Received 29 April 2016, Accepted 30 May 2016, Published 1 August 2016.

**ABSTRACT**

Since 1970, the Solomon Islands elapid genus *Salomonelaps* McDowell, 1970 has been viewed by virtually all herpetologists as being comprised of a single variable species.

*Salomonelaps par* (Boulenger, 1884) has not been subjected to any serious taxonomic scrutiny, since being described.

The two species *Hoplocephalus woodfordii* Boulenger, 1888 and *H. melanurus* Boulenger, 1888 have been ignored by all authors since, except perhaps for Kinghorn (1928), Schmidt (1932) and Williams and Parker (1964), who recognized the species "*par*" and "*woodfordii*" in their accounts.

More recently when erecting the genus *Salomonelaps*, McDowell (1970) treated "*woodfordii*" and "*melanurus*" as synonyms of "*par*".

However, inspection of specimens from the majority of islands *Salomonelaps* occurs confirms the belief of McCoy (2006) that populations are significantly different on various islands.

This includes consistent differences in scalation, colouration, dentition and hemipene morphology and can be reliably used to separate each form.

As a result, of an assessment of the snakes and the relevant available genetic evidence involving species affected by the same geographical barriers, e.g. lizards of the genera *Corucia* Gray, 1855 and *Tribolonotus* Duméril and Bibron, 1839 as detailed by Austin *et al.* (2010) and Hagen *et al.* (2012), and the geological evidence of relevance, it is clear that the relevant forms are sufficiently divergent to warrant taxonomic recognition.

Thus seven distinctive forms are herein given taxonomic recognition. All of *S. par*, *S. woodfordii* and *S. melanurus* are recognized as full species. Of the remaining four forms that are named for the first time, three are treated as subspecies of *S. par*, as it is likely that their populations were connected in the recent past during glacial maxima as outlined by Hagen *et al.* (2012), even though they are now clearly isolated and evolving independently of one another. Another, population from Malaita, believed to have been separated from the other populations the longest and thought not to be connected in recent ice age maxima, is herein treated as a full species.

Rafting between islands is not viewed as a significant means of dispersal or ongoing gene flow, beyond times of initial colonisation for reasons given by Hagen *et al.* (2012) and Balsai (1995) and also due to the absence of the genus from nearby islands such as San Cristobal or beyond the Bougainville group.

**Keywords:** Taxonomy; snakes; genus; *Salomonelaps*; species; *par*, *woodfordii*, *melanurus*; Boulenger; Solomon Islands; Solomons; Guadalcanal; Ngela; Nggela, Malaita; San Cristobal; Shortland Island; New Georgia; Fauro; Santa Isabel; Choiseul; Florida Islands; Bougainville; new species; *desburkei*; new subspecies; *ngelaensis*; *choiseulensis*; *shortlandensis*.

**INTRODUCTION**

Since 1970, the Solomon Islands elapid genus *Salomonelaps* McDowell, 1970 has been viewed by all herpetologists as being comprised of a single variable species. This view has not until now been questioned or challenged in spite of mounting evidence to the contrary. *Salomonelaps par* (Boulenger, 1884) has not been subjected to any serious taxonomic scrutiny, since

being described, save for McDowell's work in 1970.

McDowell did an excellent job of summarizing physical differences between populations from different islands, but failed to see the significance of these differences, considering them mere variations in a wide-ranging species.

However it should be noted that in 1970, the time McDowell's study was published, he was isolated from molecular studies not

available at the time.

He also was unable to merge this evidence with what is now well known about the recent geological past, in terms of ice-age maxima, changing sea levels and climates and the roles these play in speciation, either in these relevant snakes or other reptile taxa affected by the same factors, all of which have led to different conclusions made here and in the face of a lot of identical evidence.

The two species *Hoplocephalus woodfordii* Boulenger, 1888 and *H. melanurus* Boulenger, 1888 have been ignored by all authors since being named, except perhaps for Kinghorn (1928) and Schmidt (1932), who recognized the species "*par*" and "*woodfordii*" in their accounts, and ignoring the account of Williams and Parker (1964) who only accepted *H. woodfordii* on the grounds of precedent (McDowell, 1970).

More recently when erecting the genus *Salomonelaps* McDowell (1970) treated both "*woodfordii*" and "*melanurus*" as synonyms of "*par*".

This appears to have been the taxonomy followed by all herpetologists since then.

Inspection of a large number of specimens (several dozen) from the majority of islands *Salomonelaps* is known from and a review of the literature, including the work of McDowell (1970), confirms the statement of McCoy (2006) that populations are significantly different on various islands.

This includes consistent differences in scalation, colouration, hemipene morphology in males and dentition as outlined by McDowell (1970) and combined, these can reliably be used to separate each form.

Notwithstanding McCoy's two books on Solomon Islands herpetofauna (McCoy 1980 and McCoy 2006), which included colour photos of a number of different forms of *Salomonelaps*, until now, no one has taken the matter further in terms of assessing these snakes to see if they represent just one highly variable species, or in fact more than one.

Hence I engaged in such an assessment by reconciling morphological differences with geographical evidence to ascertain divergences between local forms to determine which were consistently different enough to be recognized as either subspecies or species.

As a result, of an assessment of the snakes and the relevant available genetic evidence involving species studied already that have been affected by the same geographical barriers (e.g. *Corucia* Gray, 1856 and *Tribolonotus* Duméril and Bibron, 1839) as detailed in the papers by Austin *et al.* (2010) and Hagen *et al.* (2012), and the geological evidence of relevance, it is clear that there are at least six relevant forms are sufficiently divergent to warrant taxonomic recognition.

Divergences were ascertained on the basis of previous ice-age maxima connections between relevant islands as explained by authors such as Bruns *et al.* (2009), Russell and Coupe (1984) and recent molecular studies on both *Corucia* Gray, 1856 and *Tribolonotus* Duméril and Bibron, 1839 as published and the relevant sources cited within.

Notwithstanding the theft of relevant materials from this author in an illegal armed raid on 17 August 2011, which were not returned (Court of Appeal Victoria 2014 and VCAT 2015), I have made a decision to publish this paper in view of the conservation significance attached to the formal recognition of unnamed species and subspecies and on the basis that further delays may in fact put these unnamed taxa at greater risk of extinction.

Thus seven distinctive forms are herein given taxonomic recognition on the basis that likely divergences exceed the timeline determined as significant by Keogh *et al.* (2003).

All of *S. par*, *S. woodfordi*, *S. melanurus* are recognized as full species. Of the remaining four forms that are named for the first time, three are treated as subspecies of *S. par*, as it is likely that their populations were connected in the recent past during

glacial maxima as outlined by Hagen *et al.* (2012), even though they are now clearly isolated, morphologically distinct and evolving independently of one another. Another form, from Malaita, believed to have been separated from the other populations the longest and thought not to be connected in recent ice age maxima, is herein treated as a full species. Rafting between islands is not viewed as a significant means of dispersal or ongoing gene flow, beyond times of initial colonisation for reasons given by Hagen *et al.* (2012) and Balsai (1995) and also due to the absence of the genus from nearby islands such as San Cristobal or beyond the Bougainville group. The islands Guadalcanal and Malaita are separated from one another and the others by a sea depth of more than 200 metres and hence do not appear to have been joined at any stage in the last 5 million years.

#### MATERIALS AND METHODS

These are not formally explained in a number of my recent papers under the heading "Materials and Methods" or similar, on the basis they are self evident to any vaguely perceptive reader. However, the process by which the following taxonomy and nomenclature in this and other recent papers by myself of similar form, has been arrived at, is explained herein for the benefit of people who have recently published so-called "criticisms" online of some of my recent papers. They have alleged a serious "defect" by myself not formally explaining "Materials and Methods" under such a heading.

The process involved in creating the final product for this and other relevant papers has been via a combination of the following:

Genera and component species are audited to see if their classifications are correct on the basis on known type specimens, locations and the like when compared with known phylogenies and obvious morphological differences between like species.

Original descriptions and contemporary concepts of the species are matched with available specimens from across the ranges of the species to see if all conform to accepted norms.

These may include those held in museums, private collections, collected in the field, photographed, posted on the internet or held by individuals, and only when the location data is good and any other relevant data available.

Where specimens do not appear to comply with the described species (and accepted concept of the species), this non-conformation is looked at with a view to ascertaining if it is worthy of taxonomic recognition or other relevant considerations on the basis of differences that can be tested for antiquity or deduced from earlier studies.

When this appears to be the case (non-conformation), the potential target taxon is inspected as closely as practicable with a view to comparing with the nominate form or forms if other similar taxa have been previously named.

Other relevant data is also inspected, including any available molecular studies which may indicate likely divergence of populations.

Where molecular studies are unavailable for the relevant taxon or group, other studies involving species and groups constrained by the same geographical or geological barriers, or with like distribution patterns are inspected as they give reasonable indications of the likely divergences of the taxa being studied herein.

Additionally other studies involving geological history, sea level and habitat changes associated with long-term climate change, including recent ice age changes in sea levels, versus known sea depths are utilized to predict past movements of species and genus groups in order to further ascertain likely divergences between extant populations (as done in this very paper).

When all available information checks out to show taxonomically distinct populations worthy of recognition, they are then

recognized herein according to the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

This means that if a name has been properly proposed in the past, it is used. This is exactly what happens in this paper for the taxon described as *Hoplocephalus woodfordii* Boulenger, 1888.

Alternatively, if no name is available, one is proposed according to the rules of the Code as is done four times in this paper.

As a matter of trite I mention that if a target taxon or group does check out as being "in order" or properly classified, a paper is usually not published unless some other related taxon is named for the first time.

The published literature relevant to the taxonomic judgements made within this paper includes papers relevant to Solomon Islands species affected by the same physical barriers to dispersion as well as those directly relevant to *Salomonelaps*. Combined, they include the following:

Adler, *et al.* (1995), Austin *et al.* (2010), Balsai (1995), Barbour (1921), Boseto and Pikacha (2016), Boulenger (1884, 1886, 1887), Bruns *et al.* (1989), Cogger (1972), Dahl (1986), Duméril and Bibron (1839), Gray (1856), Greer (1982), Greer and Parker (1967), Greer and Simon (1982), Hagen *et al.* (2012), Hall (2002), Iskandar and Erdelen (2006), Keogh *et al.* (2003), Kinghorn (1928, 1937), McCoy (1980, 2006), McDowell (1970), Mys (1988), Ogilby (1890), Pianka and Vitt (2003), Pylon *et al.* (2013), Reeder (2003), Rittmeyer and Austin (2015), Russell and Coupe (1984), Schmidt (1932), Williams and Parker (1964), Zweifel (1966), and sources cited therein.

#### GENUS SALOMONELAPS McDOWELL, 1970.

**Type species:** *Hoplocephalus par* Boulenger, 1884.

**Diagnosis:** Because until now the elapid genus has been treated as monotypic, the diagnosis has been treated as the same for both genus and species.

All species and subspecies in the genus (as recognized herein) can be defined as follows:

The head is slightly depressed, distinct from the neck. The eye is moderate and nearly as long as its distance from the mouth. Nasal may be single, but is usually divided and if single always has a groove. One preocular, two postoculars. Internasals half as long as the prefrontals. The rostral is broader than deep and just visible from above. The frontal is as wide as long or slightly longer, nearly twice as broad as the supraocular, as long as its distance from the rostral, much shorter than the parietals. Posterior nasal is in contact with the preocular. 7 Supralabials, in which the third and fourth enter the eye. Four lower labials are in contact with the anterior chin-shields, which are shorter than the posterior. Temporals 1+2. The rostral is wider than deep and visible from above. Midbody scales in 15-17 rows, 158-180 ventrals and the anal is divided. 38-59 subcaudals may be either all single, all divided or a combination of these, often relevant to a given island population.

McDowell (1970) gives a more detailed description of the genus and also comparisons with the related genera of *Ogmodon* Peters, 1864 and *Loveridgelaps* McDowell, 1970, as well as the distantly related genus *Parapistocalamus* Roux, 1934.

**Content:** *Salomonelaps par* (Boulenger, 1884) (type species) (including three subspecies); *S. desburkei* sp. nov.; *S. melanurus* (Boulenger, 1888); *S. woodfordii* (Boulenger, 1888).

#### SALOMONELAPS PAR (BOULENGER, 1884).

**Holotype:** A specimen at the Museum of Natural History, UK, specimen number: BMNH 1946.1.20.66 from Fauro Island, Solomon Islands, situated immediately south-east of Bougainville and west of the Bougainville Strait.

**Diagnosis:** *Salomonelaps par* is diagnosed as for the genus and separated from the other species and subspecies in the genus, as follows:

The nominate subspecies of *S. par* from Bougainville and immediately offshore islands is separated from all other subspecies and species by the following unique suite of

characters: there is no dark etching of the scales of the upper labials, including the rear ones, or the scales on the head in front of the eye. There is no distinct nape at the rear of the head, although there is slight darkening in this region. The body has semi-distinct to distinct banding, slight darkening of tail and an immaculate creamish-white venter. If there are dark etched scales on the venter, they are only on the underside of the tail. There is none, or very little lightening towards the front of the snout. 158-167 ventrals.

The subspecies *S. par choiseulensis* subsp. nov. described herein, is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: semi-distinct to distinct banding. The darker bands, described by McDowell (1970) as "broad banded" are 3-5 scale lengths wide, alternating with lighter bands 1-3 scale lengths wide. The dark bands are essentially formed by prominent dark edging of the scales and similarly dark interstitial skin, whereas the interstitial skin of the pale bands is whitish. In this taxon, the venter is not immaculate. It has numerous dark etched scales over a shiny whitish background along the main part of the mid body created by extensions of the dorsal bands running across. These become prominent as one moves away from the anterior end of the snake. There is none, or very little lightening towards the front of the snout.

The subspecies *S. par ngelaensis* subsp. nov. from the Florida Islands group is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: bands invisible or rarely they are extremely indistinct (except in juveniles), scales of lower flanks have white in the centers in a manner not seen in other forms, giving a significantly different appearance to other forms. Most of the dorsal scales have a thick dark blackish etching, infilled with colour (most commonly reddish). The rostral is strongly whitish, which spreads to nearby scales of the snout. There is also a significant amount of darkening below the eye, but otherwise not around the eye.

*Salomonelaps par shortlandensis* subsp. nov. from the Shortland Islands group of the Solomon Islands is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: The pattern is banded dorsally, to a width where the dark bands are about 2 scales wide and the lighter bands are about 2-3 scales wide, being slightly wider than the dark ones (in contrast to other banded *Salomonelaps*). The colour of the dorsal scales, apart from the black edging of the scales in the dark bands, is tawny orange, in contrast to the yellowish white and immaculate belly.

In specimens of other subspecies of *S. par* the scales of the dark bands may have reddish brown centres, but the scales of the light bands are coloured like the belly.

Female *Salomonelaps par shortlandensis* subsp. nov. are unusual in having six to eight non-canalaculate maxillary teeth, versus five (rarely 4 or 6) in all other forms of *Salomonelaps*. The taxon is also unusual in having 15 mid-body rows, versus the usual number of 17 (rarely 15 or 16) in the other populations of *Salomonelaps*. Of the other forms of *Salomonelaps* 15 mid body rows is only seen in *S. melanurus* and even then it is relatively unusual. Of course *S. melanurus* is unique in terms of *Salomonelaps* by the configuration of the banding.

The species *S. woodfordi* (Boulenger, 1888) from the New Georgia island group in the Western District is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: The entire body, including the flanks is of a uniform colour, with each scale bordered by black, which results in a reticulated pattern as noted by Boulenger (1888), McDowell (1970) and McCoy (2006). The back of the head is slightly darker in colour, while the front of the snout is lighter, but not white. All the dorsal head shields have dark etching and there are whitish upper labials along the lip line, which darken higher up, near the eye. There is no darkening on the posterior dorsal surface. Subcaudals are white

and patternless or rarely with darker margins. 165-179 ventrals. Most or all subcaudals are divided (versus all or mainly single in the other species).

Rarely specimens of *S. woodfordi* may have a dorsal surface that is nearly a uniform dark grey colour, but all the scales of the first row, as well as some of those of the second row, have pale centres; ventrals and the subcaudals have dark etching on the margins.

The species *S. melanurus* (Boulenger, 1888) from Guadalcanal in the central district is characterised and separated from all other *Salomonelaps* species and subspecies by the following characters: dark etching of the upper labials, but not those in front of the eyes. There is significant darkening around the eye, especially posterior to it and darkening at the rear of the head forms a distinct nape. There is slight to significant darkening of the tail. Dorsal cross bands are noticeably more numerous and thinner than in other forms and were described by McDowell (1970) as "fine banded".

McDowell's description of the dorsal colouration was as follows: "The dark bands are narrow (about one to one and a half scale lengths wide) and separated by pale bands only slightly, if at all, wider (one to two scale lengths wide). The general colour is neutral or greyish brown, without orange tone, although the scales may become almost uniform black, particularly posteriorly, so that the banding pattern is visible only on the interstitial skin. The bands do not extend onto the ventral surface and there is no contrast between the colour of the belly and that of the pale dorsal bands."

*S. melanurus* has 164-170 ventrals.

The new species *S. desburkei* sp. nov. from Malaita in the Malaita district is characterised and separated from the other species of *Salomonelaps* McDowell, 1970 by the presence of upper labials that are lighter near the lip, darkening towards the eye-line and a dorsal pattern with semidistinct bands in adults. The darker bands, described by McDowell (1970) as "broad banded" are 3-5 scale lengths wide, alternating with lighter bands 1-3 scale lengths wide. The dark bands are essentially formed by prominent dark edging of the scales and similarly dark interstitial skin, whereas the interstitial skin of the pale bands is whitish. The dorsal pattern does not appear reticulated as seen in *S. woodfordi* (described below).

In *S. desburkei* sp. nov. the dorsal pattern does not extend to the venter as seen in broad banded *Salomonelaps* or those with semi-distinct or indistinct bands from other islands, such as Ngella or Santa Isabella.

Male *S. desburkei* sp. nov. are further separated from all other species in the genus by the following suite of characters for the hemipenes, Organ to subcaudal (13), forked at subcaudal (11), Sulcus forked at subcaudal (9), Large spines begin at subcaudal 7.

**Distribution:** The nominate subspecies of *S. par par* is believed to be restricted to the Bougainville Group of islands only, as in islands west of the Bougainville Strait including Fauro and Buka islands. See the following subspecies descriptions for the distribution of other forms of *S. par* in the Solomon Islands, to complete the distribution for all *S. par* subspecies.

**SALOMONELAPS PAR CHOISEULENSIS SUBSP. NOV.**

**Holotype:** A preserved specimen at the Museum of Comparative Zoology, Harvard University, USA, specimen number: R-193030 collected from a trail running from Ghargara Village to Sarelata Camp, Choiseul Island, Solomon Islands.

The Museum of Comparative Zoology, Harvard University, USA is a public facility that allows access to its specimen holdings.

**Paratype:** A preserved specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R.127354 collected from Gnulahaghe Village, Ysabel Island (Santa Isabela), Solomon Islands (8°07' S, 159°32' E).

**Diagnosis:** *Salomonelaps par* is diagnosed as for the genus and separated from the other species and subspecies in the

genus, as follows:

The nominate subspecies of *S. par* from Bougainville and immediately offshore islands is separated from all other subspecies and species by the following unique suite of characters: there is no dark etching of the scales of the upper labials, including the rear ones, or the scales on the head in front of the eye. There is no distinct nape at the rear of the head, although there is slight darkening in this region. The body has semi-distinct to distinct banding, slight darkening of tail and an immaculate creamish-white venter. If there are dark etched scales on the venter, they are only on the underside of the tail. There is none, or very little lightening towards the front of the snout.

The subspecies *S. par choiseulensis* subsp. nov. described herein, is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: semi-distinct to distinct banding. The darker bands, described by McDowell (1970) as "broad banded" are 3-5 scale lengths wide, alternating with lighter bands 1-3 scale lengths wide. The dark bands are essentially formed by prominent dark edging of the scales and similarly dark interstitial skin, whereas the interstitial skin of the pale bands is whitish. In this taxon, the venter is not immaculate. It has numerous dark etched scales over a shiny whitish background along the main part of the mid body created by extensions of the dorsal bands running across. These become prominent as one moves away from the anterior end of the snake. There is none, or very little lightening towards the front of the snout.

The subspecies *S. par ngelaensis* subsp. nov. from the Florida Islands group is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: bands invisible or rarely they are extremely indistinct (except in juveniles), scales of lower flanks have white in the centers in a manner not seen in other forms, giving a significantly different appearance to other forms. Most of the dorsal scales have a thick dark blackish etching, infilled with colour (most commonly reddish). The rostral is strongly whitish, which spreads to nearby scales of the snout. There is also a significant amount of darkening below the eye, but otherwise not around the eye.

*Salomonelaps par shortlandensis* subsp. nov. from the Shortland Islands group of the Solomon Islands is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: The pattern is banded dorsally, to a width where the dark bands are about 2 scales wide and the lighter bands are about 2-3 scales wide, being slightly wider than the dark ones (in contrast to other banded *Salomonelaps*). The colour of the dorsal scales, apart from the black edging of the scales in the dark bands, is tawny orange, in contrast to the yellowish white and immaculate belly.

In specimens of other subspecies of *S. par* the scales of the dark bands may have reddish brown centres, but the scales of the light bands are coloured like the belly.

Female *Salomonelaps par shortlandensis* subsp. nov. are unusual in having six to eight non-canaliculate maxillary teeth, versus five (rarely 4 or 6) in all other forms of *Salomonelaps*. The taxon is also unusual in having 15 mid-body rows, versus the usual number of 17 (rarely 15 or 16) in the other populations of *Salomonelaps*. Of the other forms of *Salomonelaps* 15 mid body rows is only seen in *S. melanurus* and even then it is relatively unusual. Of course *S. melanurus* is unique in terms of *Salomonelaps* by the configuration of the banding.

The species *S. woodfordi* (Boulenger, 1888) from the New Georgia island group in the Western District is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: The entire body, including the flanks is of a uniform colour, with each scale bordered by black, which results in a reticulated pattern as noted by Boulenger (1888), McDowell (1970) and McCoy (2006). The back of the head is slightly darker in colour, while the front of the

snout is lighter, but not white. All the dorsal head shields have dark etching and there are whitish upper labials along the lip line, which darken higher up, near the eye. There is no darkening on the posterior dorsal surface. Subcaudals are white and patternless or rarely with darker margins. 165-179 ventrals. Most or all subcaudals are divided (versus all or mainly single in the other species).

Rarely specimens of *S. woodfordi* may have a dorsal surface that is nearly a uniform dark grey colour, but all the scales of the first row, as well as some of those of the second row, have pale centres; ventrals and the subcaudals have dark etching on the margins.

The species *S. melanurus* (Boulenger, 1888) from Guadalcanal in the central district is characterised and separated from all other *Salomonelaps* species and subspecies by the following characters: dark etching of the upper labials, but not those in front of the eyes. There is significant darkening around the eye, especially posterior to it and darkening at the rear of the head forms a distinct nape. There is slight to significant darkening of the tail. Dorsal cross bands are noticeably more numerous and thinner than in other forms as were described by McDowell (1970) as "fine banded".

McDowell's description of the dorsal colouration was as follows: "The dark bands are narrow (about one to one and a half scale lengths wide) and separated by pale bands only slightly, if at all, wider (one to two scale lengths wide). The general colour is neutral or greyish brown, without orange tone, although the scales may become almost uniform black, particularly posteriorly, so that the banding pattern is visible only on the interstitial skin. The bands do not extend onto the ventral surface and there is no contrast between the colour of the belly and that of the pale dorsal bands."

*S. melanurus* has 164-170 ventrals.

The new species *S. desburkei* sp. nov. from Malaita in the Malaita district is characterised and separated from the other species of *Salomonelaps* McDowell, 1970 by the presence of upper labials that are lighter near the lip, darkening towards the eye-line and a dorsal pattern with semidistinct bands in adults. The darker bands, described by McDowell (1970) as "broad banded" are 3-5 scale lengths wide, alternating with lighter bands 1-3 scale lengths wide. The dark bands are essentially formed by prominent dark edging of the scales and similarly dark interstitial skin, whereas the interstitial skin of the pale bands is whiteish. The dorsal pattern does not appear reticulated as seen in *S. woodfordi* (described below).

In *S. desburkei* sp. nov. the dorsal pattern does not extend to the venter as seen in broad banded *Salomonelaps* or those with semi-distinct or indistinct bands from other islands, such as Ngella or Santa Isabella.

Male *S. desburkei* sp. nov. are further separated from all other species in the genus by the following suite of characters for the hemipenes, Organ to subcaudal (13), forked at subcaudal (11), Sulcus forked at subcaudal (9), Large spines begin at subcaudal 7.

**Distribution:** Choiseul, Santa Isabel and immediately offshore smaller islands, Solomon Islands.

**Etymology:** Named in reflection of where the taxon is found.

**SALOMONELAPS PAR NGELAENSIS SUBSP. NOV.**

**Holotype:** A preserved specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R.91262, collected from Mboromole, Nggela Island, Solomon Islands (9°03' S, 160°18' E).

The Australian Museum, Sydney, NSW, Australia is a public facility that allows access to its specimen holdings.

**Paratypes:** Three preserved specimens at the Australian Museum, Sydney, NSW, Australia, specimen numbers: R.91261, R.91227 and R.91263, collected from Boromole, Nggela Island, Solomon Islands (9°03' S, 160°18' E).

**Diagnosis:** *Salomonelaps par* is diagnosed as for the genus and separated from the other species and subspecies in the genus, as follows:

The nominate subspecies of *S. par* from Bougainville and immediately offshore islands is separated from all other subspecies and species by the following unique suite of characters: there is no dark etching of the scales of the upper labials, including the rear ones, or the scales on the head in front of the eye. There is no distinct nape at the rear of the head, although there is slight darkening in this region. The body has semi-distinct to distinct banding, slight darkening of tail and an immaculate creamish-white venter. If there are dark etched scales on the venter, they are only on the underside of the tail. There is none, or very little lightening towards the front of the snout.

The subspecies *S. par ngelaensis* subsp. nov. from the Florida Islands group described herein, is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: bands invisible or rarely they are extremely indistinct (except in juveniles), scales of lower flanks have white in the centers in a manner not seen in other forms, giving a significantly different appearance to other forms. Most of the dorsal scales have a thick dark blackish etching, infilled with colour (most commonly reddish). The rostral is strongly whitish, which spreads to nearby scales of the snout. There is also a significant amount of darkening below the eye, but otherwise not around the eye.

The subspecies *S. par choiseulensis* subsp. nov. described herein, is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: semi-distinct to distinct banding. The darker bands, described by McDowell (1970) as "broad banded" are 3-5 scale lengths wide, alternating with lighter bands 1-3 scale lengths wide. The dark bands are essentially formed by prominent dark edging of the scales and similarly dark interstitial skin, whereas the interstitial skin of the pale bands is whiteish. In this taxon, the venter is not immaculate. It has numerous dark etched scales over a shiny whitish background along the main part of the mid body created by extensions of the dorsal bands running across. These become prominent as one moves away from the anterior end of the snake. There is none, or very little lightening towards the front of the snout.

*Salomonelaps par shortlandensis* subsp. nov. from the Shortland Islands group of the Solomon Islands is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: The pattern is banded dorsally, to a width where the dark bands are about 2 scales wide and the lighter bands are about 2-3 scales wide, being slightly wider than the dark ones (in contrast to other banded *Salomonelaps*). The colour of the dorsal scales, apart from the black edging of the scales in the dark bands, is tawny orange, in contrast to the yellowish white and immaculate belly.

In specimens of other subspecies of *S. par* the scales of the dark bands may have reddish brown centres, but the scales of the light bands are coloured like the belly.

Female *Salomonelaps par shortlandensis* subsp. nov. are unusual in having six to eight non-canalicate maxillary teeth, versus five (rarely 4 or 6) in all other forms of *Salomonelaps*. The taxon is also unusual in having 15 mid-body rows, versus the usual number of 17 (rarely 15 or 16) in the other populations of *Salomonelaps*. Of the other forms of *Salomonelaps* 15 mid body rows is only seen in *S. melanurus* and even then it is relatively unusual. Of course *S. melanurus* is unique in terms of *Salomonelaps* by the configuration of the banding.

The species *S. woodfordi* (Boulenger, 1888) from the New Georgia island group in the Western District is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: The entire body, including the flanks is of a uniform colour, with each scale bordered by black, which results in a reticulated pattern as noted



by Boulenger (1888), McDowell (1970) and McCoy (2006). The back of the head is slightly darker in colour, while the front of the snout is lighter, but not white. All the dorsal head shields have dark etching and there are whitish upper labials along the lip line, which darken higher up, near the eye. There is no darkening on the posterior dorsal surface. Subcaudals are white and patternless or rarely with darker margins. 165-179 ventrals. Most or all subcaudals are divided (versus all or mainly single in the other species).

Rarely specimens of *S. woodfordi* may have a dorsal surface that is nearly a uniform dark grey colour, but all the scales of the first row, as well as some of those of the second row, have pale centres; ventrals and the subcaudals have dark etching on the margins.

The species *S. melanurus* (Boulenger, 1888) from Guadalcanal in the central district is characterised and separated from all other *Salomonelaps* species and subspecies by the following characters: dark etching of the upper labials, but not those in front of the eyes. There is significant darkening around the eye, especially posterior to it and darkening at the rear of the head forms a distinct nape. There is slight to significant darkening of the tail. Dorsal cross bands are noticeably more numerous and thinner than in other forms as were described by McDowell (1970) as "fine banded".

McDowell's description of the dorsal colouration was as follows: "The dark bands are narrow (about one to one and a half scale lengths wide) and separated by pale bands only slightly, if at all, wider (one to two scale lengths wide). The general colour is neutral or greyish brown, without orange tone, although the scales may become almost uniform black, particularly posteriorly, so that the banding pattern is visible only on the interstitial skin. The bands do not extend onto the ventral surface and there is no contrast between the colour of the belly and that of the pale dorsal bands."

*S. melanurus* has 164-170 ventrals.

The new species *S. desburkei* sp. nov. from Malaita in the Malaita district is characterised and separated from the other species of *Salomonelaps* McDowell, 1970 by the presence of upper labials that are lighter near the lip, darkening towards the eye-line and a dorsal pattern with semidistinct bands in adults. The darker bands, described by McDowell (1970) as "broad banded" are 3-5 scale lengths wide, alternating with lighter bands 1-3 scale lengths wide. The dark bands are essentially formed by prominent dark edging of the scales and similarly dark interstitial skin, whereas the interstitial skin of the pale bands is whiteish. The dorsal pattern does not appear reticulated as seen in *S. woodfordi* (described below).

In *S. desburkei* sp. nov. the dorsal pattern does not extend to the venter as seen in broad banded *Salomonelaps* or those with semi-distinct or indistinct bands from other islands, such as *Ngella* or *Santa Isabella*.

Male *S. desburkei* sp. nov. are further separated from all other species in the genus by the following suite of characters for the hemipenes, Organ at subcaudal (13), forked at subcaudal (11), Sulcus forked at subcaudal (9), Large spines begin at subcaudal 7.

**Distribution:** Believed to be restricted to the Florida islands in the Central District of the Solomon Islands (*Ngela* (AKA *Nggela*), including *Nggela Sule*, *Nggela Pile*, etc).

**Etymology:** This snake is named in reflection of where the taxon is found. The spelling is intentional, even if treated in error by a later reviser and should not be changed.

**SALOMONELAPS PAR SHORTLANDENSIS SUBSP. NOV.**

**Holotype:** A preserved specimen at the Museum of Comparative Zoology, Harvard University, USA, specimen number: R-88455 collected from Maliai, Magusaiai Island, in the Shortland Islands Group of the Solomon Islands.

The Museum of Comparative Zoology, Harvard University, USA

is a facility that allows access to its specimen holdings.

**Paratypes:** Preserved specimens at the Museum of Comparative Zoology, Harvard University, USA, specimen numbers: R-88457, R-88458, R-89475 and R-89476 collected from Nohu, Magusaiai Island, in the Shortland Islands Group of the Solomon Islands.

The holotype and paratypes are all females.

**Diagnosis:** *Salomonelaps par shortlandensis* subsp. nov. from the Shortland Islands group of the Solomon Islands is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: The pattern is banded dorsally, to a width where the dark bands are about 2 scales wide and the lighter bands are about 2-3 scales wide, being slightly wider than the dark ones (in contrast to other banded *Salomonelaps*). The colour of the dorsal scales, apart from the black edging of the scales in the dark bands, is tawny orange, in contrast to the yellowish white and immaculate belly. In specimens of other subspecies of *S. par* the scales of the dark bands may have reddish brown centres, but the scales of the light bands are coloured like the belly.

Female *Salomonelaps par shortlandensis* subsp. nov. are unusual in having six to eight non-canalicular maxillary teeth, versus five (rarely 4 or 6) in all other forms of *Salomonelaps*. The taxon is also unusual in having 15 mid-body rows, versus the usual number of 17 (rarely 15 or 16) in the other populations of *Salomonelaps*. Of the other forms of *Salomonelaps* 15 mid body rows is only seen in *S. melanurus* and even then it is relatively unusual. Of course *S. melanurus* is unique in terms of *Salomonelaps* by the configuration of the banding.

*Salomonelaps par* is otherwise diagnosed as for the genus and separated from the other species and subspecies in the genus, as follows:

The nominate subspecies of *S. par* from Bougainville and immediately offshore islands is separated from all other subspecies and species by the following unique suite of characters: there is no dark etching of the scales of the upper labials, including the rear ones, or the scales on the head in front of the eye. There is no distinct nape at the rear of the head, although there is slight darkening in this region. The body has semi-distinct to distinct banding, slight darkening of tail and an immaculate creamish-white venter. If there are dark etched scales on the venter, they are only on the underside of the tail. There is none, or very little lightening towards the front of the snout.

The subspecies *S. par ngelaensis* subsp. nov. from the Florida Islands group described herein, is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: bands invisible or rarely they are extremely indistinct (except in juveniles), scales of lower flanks have white in the centers in a manner not seen in other forms, giving a significantly different appearance to other forms. Most of the dorsal scales have a thick dark blackish etching, infilled with colour (most commonly reddish). The rostral is strongly whitish, which spreads to nearby scales of the snout. There is also a significant amount of darkening below the eye, but otherwise not around the eye.

The subspecies *S. par choiseulensis* subsp. nov. described herein, is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: semi-distinct to distinct banding. The darker bands, described by McDowell (1970) as "broad banded" are 3-5 scale lengths wide, alternating with lighter bands 1-3 scale lengths wide. The dark bands are essentially formed by prominent dark edging of the scales and similarly dark interstitial skin, whereas the interstitial skin of the pale bands is whiteish. In this taxon, the venter is not immaculate. It has numerous dark etched scales over a shiny whitish background along the main part of the mid body created by extensions of the dorsal bands running across. These become prominent as one moves away from the

anterior end of the snake. There is none, or very little lightening towards the front of the snout.

The species *S. woodfordi* (Boulenger, 1888) from the New Georgia island group in the Western District is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: The entire body, including the flanks is of a uniform colour, with each scale bordered by black, which results in a reticulated pattern as noted by Boulenger (1888), McDowell (1970) and McCoy (2006). The back of the head is slightly darker in colour, while the front of the snout is lighter, but not white. All the dorsal head shields have dark etching and there are whitish upper labials along the lip line, which darken higher up, near the eye. There is no darkening on the posterior dorsal surface. Subcaudals are white and patternless or rarely with darker margins. 165-179 ventrals. Most or all subcaudals are divided (versus all or mainly single in the other species).

Rarely specimens of *S. woodfordi* may have a dorsal surface that is nearly a uniform dark grey colour, but all the scales of the first row, as well as some of those of the second row, have pale centres; ventrals and the subcaudals have dark etching on the margins.

The species *S. melanurus* (Boulenger, 1888) from Guadalcanal in the central district is characterised and separated from all other *Salomonelaps* species and subspecies by the following characters: dark etching of the upper labials, but not those in front of the eyes. There is significant darkening around the eye, especially posterior to it and darkening at the rear of the head forms a distinct nape. There is slight to significant darkening of the tail. Dorsal cross bands are noticeably more numerous and thinner than in other forms as were described by McDowell (1970) as "fine banded".

McDowell's description of the dorsal colouration was as follows: "The dark bands are narrow (about one to one and a half scale lengths wide) and separated by pale bands only slightly, if at all, wider (one to two scale lengths wide). The general colour is neutral or greyish brown, without orange tone, although the scales may become almost uniform black, particularly posteriorly, so that the banding pattern is visible only on the interstitial skin. The bands do not extend onto the ventral surface and there is no contrast between the colour of the belly and that of the pale dorsal bands."

*S. melanurus* has 164-170 ventrals.

The new species *S. desburkei* sp. nov. from Malaita in the Malaita district is characterised and separated from the other species of *Salomonelaps* McDowell, 1970 by the presence of upper labials that are lighter near the lip, darkening towards the eye-line and a dorsal pattern with semidistinct bands in adults. The darker bands, described by McDowell (1970) as "broad banded" are 3-5 scale lengths wide, alternating with lighter bands 1-3 scale lengths wide. The dark bands are essentially formed by prominent dark edging of the scales and similarly dark interstitial skin, whereas the interstitial skin of the pale bands is whiteish. The dorsal pattern does not appear reticulated as seen in *S. woodfordi* (described below).

In *S. desburkei* sp. nov. the dorsal pattern does not extend to the venter as seen in broad banded *Salomonelaps* or those with semi-distinct or indistinct bands from other islands, such as Ngella or Santa Isabella.

Male *S. desburkei* sp. nov. are further separated from all other species in the genus by the following suite of characters for the hemipenes, Organ to subcaudal (13), forked at subcaudal (11), Sulcus forked at subcaudal (9), Large spines begin at subcaudal 7.

**Distribution:** Shortland Island and the immediately adjacent Magusaiai Island, Solomon Islands.

**Etymology:** This snake is named in reflection of where the taxon is found. The spelling is intentional, even if treated in error by a later reviser, and should not be changed.

#### **SALOMONELAPS WOODFORDI (BOULENGER, 1888).**

**Holotype:** A female specimen from Rubiana, New Georgia, Solomon Islands.

**Diagnosis:** The species *S. woodfordi* (Boulenger, 1888) from the New Georgia island group in the Western District is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: The entire body, including the flanks is of a uniform colour, with each scale bordered by black, which results in a reticulated pattern as noted by Boulenger (1888), McDowell (1970) and McCoy (2006). The back of the head is slightly darker in colour, while the front of the snout is lighter, but not white. All the dorsal head shields have dark etching and there are whitish upper labials along the lip line, which darken higher up, near the eye. There is no darkening on the posterior dorsal surface. Subcaudals are white and patternless or rarely with darker margins. 165-179 ventrals. Most or all subcaudals are divided (versus all or mainly single in the other species).

Rarely specimens of *S. woodfordi* may have a dorsal surface that is nearly a uniform dark grey colour, but all the scales of the first row, as well as some of those of the second row, have pale centres; ventrals and the subcaudals have dark etching on the margins.

For diagnostic features of the other species and subspecies of *Salomonelaps*, see the preceding description of *S. par*.

**Distribution:** The New Georgia group of islands in the Western District of the Solomon Islands.

#### **SALOMONELAPS MELANURUS BOULENGER, 1888.**

**Holotype:** Specimen number BM 1946.1.18.61 at the Museum of Natural History, UK, collected from Guadalcanal, as designated by McDowell (1970) as first reviser.

**Diagnosis:** The species *S. melanurus* (Boulenger, 1888) from Guadalcanal in the central district is characterised and separated from all other *Salomonelaps* species and subspecies by the following characters: dark etching of the upper labials, but not those in front of the eyes. There is significant darkening around the eye, especially posterior to it and darkening at the rear of the head forms a distinct nape. There is slight to significant darkening of the tail. Dorsal cross bands are noticeably more numerous and thinner than in other forms as were described by McDowell (1970) as "fine banded".

McDowell's description of the dorsal colouration was as follows: "The dark bands are narrow (about one to one and a half scale lengths wide) and separated by pale bands only slightly, if at all, wider (one to two scale lengths wide). The general colour is neutral or greyish brown, without orange tone, although the scales may become almost uniform black, particularly posteriorly, so that the banding pattern is visible only on the interstitial skin. The bands do not extend onto the ventral surface and there is no contrast between the colour of the belly and that of the pale dorsal bands."

*S. melanurus* has 164-170 ventrals.

*Salomonelaps par* is diagnosed as for the genus and separated from the other species and subspecies in the genus, as follows:

The nominate subspecies of *S. par* from Bougainville and immediately offshore islands is separated from all other subspecies and species by the following unique suite of characters: there is no dark etching of the scales of the upper labials, including the rear ones, or the scales on the head in front of the eye. There is no distinct nape at the rear of the head, although there is slight darkening in this region. The body has semi-distinct to distinct banding, slight darkening of tail and an immaculate creamish-white venter. If there are dark etched scales on the venter, they are only on the underside of the tail. There is none, or very little lightening towards the front of the snout.

The subspecies *S. par choiseulensis* subsp. nov. described herein, is separated from all other species and subspecies of

*Salomonelaps* McDowell, 1970 by the following suite of characters: semi-distinct to distinct banding. The darker bands, described by McDowell (1970) as "broad banded" are 3-5 scale lengths wide, alternating with lighter bands 1-3 scale lengths wide. The dark bands are essentially formed by prominent dark edging of the scales and similarly dark interstitial skin, whereas the interstitial skin of the pale bands is whiteish. In this taxon, the venter is not immaculate. It has numerous dark etched scales over a shiny whitish background along the main part of the mid body created by extensions of the dorsal bands running across. These become prominent as one moves away from the anterior end of the snake. There is none, or very little lightening towards the front of the snout.

The subspecies *S. par ngelaensis* subsp. nov. from the Florida Islands group is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: bands invisible or rarely they are extremely indistinct (except in juveniles), scales of lower flanks have white in the centers in a manner not seen in other forms, giving a significantly different appearance to other forms. Most of the dorsal scales have a thick dark blackish etching, infilled with colour (most commonly reddish). The rostral is strongly whitish, which spreads to nearby scales of the snout. There is also a significant amount of darkening below the eye, but otherwise not around the eye.

*Salomonelaps par shortlandensis* subsp. nov. from the Shortland Islands group of the Solomon Islands is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: The pattern is banded dorsally, to a width where the dark bands are about 2 scales wide and the lighter bands are about 2-3 scales wide, being slightly wider than the dark ones (in contrast to other banded *Salomonelaps*). The colour of the dorsal scales, apart from the black edging of the scales in the dark bands, is tawny orange, in contrast to the yellowish white and immaculate belly.

In specimens of other subspecies of *S. par* the scales of the dark bands may have reddish brown centres, but the scales of the light bands are coloured like the belly.

Female *Salomonelaps par shortlandensis* subsp. nov. are unusual in having six to eight non-canalicular maxillary teeth, versus five (rarely 4 or 6) in all other forms of *Salomonelaps*. The taxon is also unusual in having 15 mid-body rows, versus the usual number of 17 (rarely 15 or 16) in the other populations of *Salomonelaps*. Of the other forms of *Salomonelaps* 15 mid body rows is only seen in *S. melanurus* and even then it is relatively unusual. Of course *S. melanurus* is unique in terms of *Salomonelaps* by the configuration of the dorsal banding.

The species *S. woodfordi* (Boulenger, 1888) from the New Georgia island group in the Western District is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: The entire body, including the flanks is of a uniform colour, with each scale bordered by black, which results in a reticulated pattern as noted by Boulenger (1888), McDowell (1970) and McCoy (2006). The back of the head is slightly darker in colour, while the front of the snout is lighter, but not white. All the dorsal head shields have dark etching and there are whitish upper labials along the lip line, which darken higher up, near the eye. There is no darkening on the posterior dorsal surface. Subcaudals are white and patternless or rarely with darker margins. 165-179 ventrals. Most or all subcaudals are divided (versus all or mainly single in the other species).

Rarely specimens of *S. woodfordi* may have a dorsal surface that is nearly a uniform dark grey colour, but all the scales of the first row, as well as some of those of the second row, have pale centres; ventrals and the subcaudals have dark etching on the margins.

The new species *S. desburkei* sp. nov. from Malaita in the Malaita district is characterised and separated from the other species of *Salomonelaps* McDowell, 1970 by the presence of

upper labials that are lighter near the lip, darkening towards the eye-line and a dorsal pattern with semidistinct bands in adults. The darker bands, described by McDowell (1970) as "broad banded" are 3-5 scale lengths wide, alternating with lighter bands 1-3 scale lengths wide. The dark bands are essentially formed by prominent dark edging of the scales and similarly dark interstitial skin, whereas the interstitial skin of the pale bands is whiteish. The dorsal pattern does not appear reticulated as seen in *S. woodfordi* (described below).

In *S. desburkei* sp. nov. the dorsal pattern does not extend to the venter as seen in broad banded *Salomonelaps* or those with semi-distinct or indistinct bands from other islands, such as Ngella or Santa Isabella.

Male *S. desburkei* sp. nov. are further separated from all other species in the genus by the following suite of characters for the hemipenes, Organ to subcaudal (13), forked at subcaudal (11), Sulcus forked at subcaudal (9), Large spines begin at subcaudal 7.

**Distribution:** Guadalcanal in the central district of Solomon Islands, and immediately adjacent islets, but not including the Florida Islands (Ngela, AKA Nggela Sule, Nggela Pile, etc) to the near north.

#### **SALOMONELAPS DESBURKEI SP. NOV.**

**Holotype:** A preserved specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R.87374, collected within a 3 km radius of Bitaaama, North Malaita, Solomon Islands (8°24' S, 160°36' E).

The Australian Museum, Sydney, NSW, Australia is a public facility that allows access to its specimen holdings.

**Paratypes:** A preserved specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R.87375, collected within a 3 km radius of Bitaaama, North Malaita, Solomon Islands (8°24' S, 160°36' E) and a preserved specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R.137237 collected at Bsurata Village, Malaita Island, Solomon Islands (8°49' S, 160°49' E).

**Diagnosis:** The new species *S. desburkei* sp. nov. from Malaita in the Malaita district is characterised and separated from the other species of *Salomonelaps* McDowell, 1970 by the presence of upper labials that are lighter near the lip, darkening towards the eye-line and a dorsal pattern with semidistinct bands in adults. The darker bands, described by McDowell (1970) as "broad banded" are 3-5 scale lengths wide, alternating with lighter bands 1-3 scale lengths wide. The dark bands are essentially formed by prominent dark edging of the scales and similarly dark interstitial skin, whereas the interstitial skin of the pale bands is whiteish. The dorsal pattern does not appear reticulated as seen in *S. woodfordi* (described below).

In *S. desburkei* sp. nov. the dorsal pattern does not extend to the venter as seen in broad banded *Salomonelaps* or those with semi-distinct or indistinct bands from other islands, such as Ngella or Santa Isabella.

Male *S. desburkei* sp. nov. are further separated from all other species in the genus by the following suite of characters for the hemipenes, Organ to subcaudal (13), forked at subcaudal (11), Sulcus forked at subcaudal (9), Large spines begin at subcaudal 7.

*Salomonelaps par* is diagnosed as for the genus and separated from the other species and subspecies in the genus, as follows:

The nominate subspecies of *S. par* from Bougainville and immediately offshore islands is separated from all other subspecies and species by the following unique suite of characters: there is no dark etching of the scales of the upper labials, including the rear ones, or the scales on the head in front of the eye. There is no distinct nape at the rear of the head, although there is slight darkening in this region. The body has semi-distinct to distinct banding, slight darkening of tail and an immaculate creamish-white venter. If there are dark etched scales on the venter, they are only on the underside of the tail.

There is none, or very little lightening towards the front of the snout.

The subspecies *S. par choiseulensis* subsp. nov. described herein, is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: semi-distinct to distinct banding. The darker bands, described by McDowell (1970) as "broad banded" are 3-5 scale lengths wide, alternating with lighter bands 1-3 scale lengths wide. The dark bands are essentially formed by prominent dark edging of the scales and similarly dark interstitial skin, whereas the interstitial skin of the pale bands is whiteish. In this taxon, the venter is not immaculate. It has numerous dark etched scales over a shiny whitish background along the main part of the mid body created by extensions of the dorsal bands running across. These become prominent as one moves away from the anterior end of the snake. There is none, or very little lightening towards the front of the snout.

The subspecies *S. par ngelaensis* subsp. nov. from the Florida Islands group is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: bands invisible or rarely they are extremely indistinct (except in juveniles), scales of lower flanks have white in the centers in a manner not seen in other forms, giving a significantly different appearance to other forms. Most of the dorsal scales have a thick dark blackish etching, infilled with colour (most commonly reddish). The rostral is strongly whitish, which spreads to nearby scales of the snout. There is also a significant amount of darkening below the eye, but otherwise not around the eye.

*Salomonelaps par shortlandensis* subsp. nov. from the Shortland Islands group of the Solomon Islands is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: The pattern is banded dorsally, to a width where the dark bands are about 2 scales wide and the lighter bands are about 2-3 scales wide, being slightly wider than the dark ones (in contrast to other banded *Salomonelaps*). The colour of the dorsal scales, apart from the black edging of the scales in the dark bands, is tawny orange, in contrast to the yellowish white and immaculate belly.

In specimens of other subspecies of *S. par* the scales of the dark bands may have reddish brown centres, but the scales of the light bands are coloured like the belly.

Female *Salomonelaps par shortlandensis* subsp. nov. are unusual in having six to eight non-canalicular maxillary teeth, versus five (rarely 4 or 6) in all other forms of *Salomonelaps*. The taxon is also unusual in having 15 mid-body rows, versus the usual number of 17 (rarely 15 or 16) in the other populations of *Salomonelaps*. Of the other forms of *Salomonelaps* 15 mid body rows is only seen in *S. melanurus* and even then it is relatively unusual. Of course *S. melanurus* is unique in terms of *Salomonelaps* by the configuration of the dorsal banding.

The species *S. woodfordi* (Boulenger, 1888) from the New Georgia island group in the Western District is separated from all other species and subspecies of *Salomonelaps* McDowell, 1970 by the following suite of characters: The entire body, including the flanks is of a uniform colour, with each scale bordered by black, which results in a reticulated pattern as noted by Boulenger (1888), McDowell (1970) and McCoy (2006). The back of the head is slightly darker in colour, while the front of the snout is lighter, but not white. All the dorsal head shields have dark etching and there are whitish upper labials along the lip line, which darken higher up, near the eye. There is no darkening on the posterior dorsal surface. Subcaudals are white and patternless or rarely with darker margins. 165-179 ventrals. Most or all subcaudals are divided (versus all or mainly single in the other species).

Rarely specimens of *S. woodfordi* may have a dorsal surface that is nearly a uniform dark grey colour, but all the scales of the first row, as well as some of those of the second row, have pale centres; ventrals and the subcaudals have dark etching on the

margins.

The species *S. melanurus* (Boulenger, 1888) from Guadalcanal in the central district is characterised and separated from all other *Salomonelaps* species and subspecies by the following characters: dark etching of the upper labials, but not those in front of the eyes. There is significant darkening around the eye, especially posterior to it and darkening at the rear of the head forms a distinct nape. There is slight to significant darkening of the tail. Dorsal cross bands are noticeably more numerous and thinner than in other forms as were described by McDowell (1970) as "fine banded".

McDowell's description of the dorsal colouration was as follows: "The dark bands are narrow (about one to one and a half scale lengths wide) and separated by pale bands only slightly, if at all, wider (one to two scale lengths wide). The general colour is neutral or greyish brown, without orange tone, although the scales may become almost uniform black, particularly posteriorly, so that the banding pattern is visible only on the interstitial skin. The bands do not extend onto the ventral surface and there is no contrast between the colour of the belly and that of the pale dorsal bands."

*S. melanurus* has 164-170 ventrals.

**Distribution:** Malaita in the Malaita district of Solomon Islands, and immediately adjacent islets, but not including the Florida Islands (Ngela, AKA Nggela Sule, Nggela Pile, etc) to the near south-west.

**Etymology:** Named in honour of Desmond (Des) Burke, of Joseph Burke Law, in recognition of his significant contributions to the Criminal Justice system in Victoria as well as his significant work in the past involving rodent breeding at this author's research facility.

#### REFERENCES CITED

- Adler, G. H., Austin, C. C. and Dudley, R. 1995. Dispersal and speciation of skinks among archipelagos in the tropical Pacific Ocean. *Evolutionary Ecology* 9:529-541.
- Austin, C. C., Rittmeyer, E. N., Richards, S. J. and Zug, G. R. 2010. Phylogeny, historical biogeography and body size evolution in Pacific Island Crocodile skinks *Tribolonotus* (Squamata; Scincidae). *Molecular Phylogenetics and Evolution* 57(1):227-236.
- Balsai, M. J. 1995. Husbandry and Breeding of the Solomon Islands Prehensile-tailed Skink, *Corucia zebrata*. *The Vivarium* 7(1):4-11.
- Barbour, T. 1921. Reptiles and amphibians from the British Solomon Islands. *Proc. New England zool. Club* 7:91-112.
- Boseto, D. and Pikacha, P. (eds) 2016. A report on baseline biodiversity inventory of Mount Maetambe to Kolobangara River Corridor, Choiseul Island, Solomon Islands. Downloaded from the website of Ecological Solutions Solomon Islands at: <http://ecologicalsolutions-si.com/files/110494600.pdf>
- Boulenger, G. A. 1884. Diagnoses of new reptiles and batrachians from the Solomon Islands, collected and presented to the British Museum by H. B. Guppy, Esq., M. B., H. M. S. 'Lark.'. *Proc. Zool. Soc. London* 1884:210-213.
- Boulenger, G. A. 1886. On the reptiles and batrachians of the Solomon Islands. *Trans. Zool. Soc. London* 12:35-62.
- Boulenger, G. A. 1887. *Catalogue of the Lizards in the British Museum (Nat. Hist.) III. Lacertidae, Gerrhosauridae, Scincidae, Anelytropsidae, Dibamidae, Chamaeleontidae*. London:575pp.
- Bruns, T. R., Vedder, J. R. and Cooper, A. K. 1989. Geology of the Shortland Basin Region, Central Solomons Trough, Solomon Islands - Review and New Findings. pp. 125-144 in Vedder, J.G., and Bruns, T. R., (editors), 1989. Geology and offshore resources of Pacific island arcs Solomon Islands and Bougainville, Papua New Guinea Regions: Houston, Texas, Circum-Pacific Council for Energy and Mineral Resources, Earth Science Series, v. 12.
- Cogger, H. G. 1972. A new scincid lizard of the genus

- Tribolonotus* from Manus Island, New Guinea. *Zool. Mededelingen* 47:202-210.
- Court of Appeal Victoria. 2014. Hoser v Department of Sustainability and Environment [2014] VSCA 206 (5 September 2014).
- Dahl, A. L. 1986. *Review of the protected areas system in Oceania*. IUCN/UNEP, Gland, Switzerland.
- Duméril, A. M. C. and Bibron, G. 1839. *Erpétologie Générale ou Histoire Naturelle Complète des Reptiles*. Vol.5. Roret/Fain et Thunot, Paris:871 pp.
- Gray, J. E. 1856. New genus of fish-scaled lizards (Scissosarae) from New Guinea. *Ann. Mag. Nat. Hist.* (2)18:345-346.
- Greer, A. E. 1982. A new species of *Geomyersia* (Scincidae) from the Admiralty Islands, with a summary of the genus. *Journal of Herpetology* 16(1):61-66.
- Greer, A. E. and Parker, F. 1967. A new scincid lizard from the northern Solomon Islands. *Breviora* (275):1-20.
- Greer, A. E. and Simon, M. 1982. *Fojia bumui*, an unusual new genus and species of scincid lizard from New Guinea. *Journal of Herpetology* 16(2):131-139.
- Hagen, I. J., Donnellan, S. C. and Bull, M. 2012. Phylogeography of the prehensile-tailed skink *Corucia zebrata* on the Solomon Archipelago. *Ecology and Evolution* (2012), 2(6):1220-1234.
- Hall, R., 2002. Cenozoic geological and plate tectonic evolution of SE Asia and the SW Pacific: computer-based reconstructions, model and animations. *J. Asian Earth Sci.* 20:353-431.
- Iskandar, D. T. and Erdelen, W. R. 2006. Conservation of amphibians and reptiles in Indonesia: issues and problems. *Amphibian and Reptile Conservation* 4(1):60-87.
- Keogh, S. J., Scott, A. W., Fitzgerald, M. and Shine, R. 2003. Molecular phylogeny of the Australian venomous snake genus *Hoplocephalus* (Serpentes, Elapidae) and conservation genetics of the threatened *H. stephensii*. *Conservation Genetics* 4:57-65.
- Kinghorn, J. R. 1928. Herpetology of the Solomon Islands. *Rec. Austral. Mus.* 16:123-178.
- Kinghorn, J. R. 1937. A new species of skink from the Solomon Islands. *Records of the Australian Museum* 20(1):1-2.
- McCoy, M. 1980. *Reptiles of the Solomon Islands*. Wau Ecology Institute Handbook 7. Wau Ecology Institute, Wau, Papua New Guinea.
- McCoy, M. 2006. *Reptiles of the Solomon Islands*. Pensoft Series Faunistica 57:212 pp.
- McDowell, S. B. 1970. On the status and relationships of the Solomon Island elapid snakes. *Journal of Zoology*, London 161:145-190.
- Mys, B. 1988. The zoogeography of the scincid lizards from North Papua New Guinea (Reptilia: Scincidae). I. The distribution of the species. *Bull. Inst. Roy. Sci. Nat. Belgique (Biologie)* 58:127-183.
- Ogilby, J. D. 1890. Report on a zoological collection from the Solomon Islands. Part 2. *Rec. Austr. Mus.* 1:5-7.
- Pianka, E. R. and Vitt, L. J. 2003. *Lizards - Windows to the Evolution of Diversity*. University of California Press, Berkeley:347 pp.
- Pyron, R. A., Burbrink, F. T. and Wiens, J. J. 2013. A phylogeny and revised classification of Squamata, including 4161 species of lizards and snakes. *BMC Evolutionary Biology* 13:1-53.
- Reeder, T. W. 2003. A phylogeny of the Australian *Sphenomorphus* group (Scincidae: Squamata) and the phylogenetic placement of the crocodile skinks (*Tribolonotus*): Bayesian approaches to assessing congruence and obtaining confidence in maximum likelihood inferred relationships. *Molecular Phylogenetics and Evolution* 27:384-397.
- Ride, W. D. L. (ed.) et al. (on behalf of the International Commission on Zoological Nomenclature) 1999. *International code of Zoological Nomenclature* (Fourth edition). The Natural History Museum - Cromwell Road, London SW7 5BD, UK (also commonly cited as "The Rules", "Zoological Rules" or "ICZN 1999").
- Rittmeyer, E. N. and Austin, C. C. 2015. Combined next-generation sequencing and morphology reveal fine-scale speciation in Crocodile Skinks (Squamata: Scincidae: *Tribolonotus*). *Mol Ecol.* 2015 Jan, 24(2):466-83. doi: 10.1111/mec.13030. Epub 2015 Jan 9.
- Russell, E. and Coupe, S. 1984. *The Macquarie World Illustrated Atlas*. Kevin Weldon, Macquarie Library, Chatswood, NSW, Australia:511 pp.
- Schmidt, K. P. 1932. Reptiles and Amphibians from the Solomon Islands. *Field Mus. Nat. Hist. Zool. Ser.* 18(9):175-190.
- Victorian Civil and Administrative Tribunal (VCAT) 2015. *Hoser v Department of Environment Land Water and Planning* (Review and Regulation) [2015] VCAT 1147 (30 July 2015).
- Williams, E. E. and Parker, F. 1964. The snake, genus *Parapistocalamus* on Bougainville, Solomon Islands. *Senckenberg. biol.* 45:543-552.
- Zweifelfel, R. G. 1966. A New Lizard of the Genus *Tribolonotus* (Scincidae) from New Britain. *American Museum Novitates* 2264:1-12.

**CONFLICT OF INTEREST**

The author has no known conflicts of interest in terms of this paper and conclusions within.

## Australasian Journal of Herpetology®

Publishes original research in printed form in relation to reptiles, other fauna and related matters, including the subjects of classification, ecology, public interest, captivity, "academic misconduct", etc. It is a peer reviewed printed journal published in hard copy for permanent public scientific record in accordance with the *International Code of Zoological Nomenclature* (Ride et al. 1999), with a sizeable print run and has a global audience.

Full details of acquiring copies, either printed or in identical form online, editorial policies, publication procedure, author submission guidelines, peer review guidelines, legal matters, advantages of publication in this journal and the like can be found by following links from:

<http://www.herp.net>

**Published by Kotabi Pty Ltd**  
**PO Box 599**  
**Doncaster, Victoria, 3108.**  
**Australia.**

**Copyright. All rights reserved.**

**Online journals (this issue) do not appear for a month after the actual and listed publication date of the printed journals. Minimum print run of first printings is always at least fifty hard copies.**

**ISSN 1836-5698 (Print)**  
**ISSN 1836-5779 (Online)**

**A division of the genus elapid genus *Loveridegelaps* McDowell, 1970 from the Solomon Islands, including formal description of four new species (Serpentes: Elapidae: Micropechiini: Loveridgelapina).**

**RAYMOND T. HOSER**

488 Park Road, Park Orchards, Victoria, 3134, Australia.

Phone: +61 3 9812 3322 Fax: 9812 3355 E-mail: snakeman (at) snakeman.com.au

Received 12 April 2016, Accepted 20 May 2016, Published 1 August 2016.

**ABSTRACT**

The species described as *Hoplocephalus elapoides* Boulenger, 1890, from Florida Island in the Solomon Islands. Since the original description, widely divergent specimens have been found across the Solomon Islands. However, no herpetologist has considered whether or not there is more than one species currently under this umbrella.

Inspection of specimens from the majority of islands *Loveridegelaps* have been found shows significant variation between specimens and of sufficient basis to warrant division into separate species.

This includes consistent differences in scalation, colouration and hemipene morphology and can be reliably used to separate each form.

As a result, of an assessment of the snakes and the relevant available genetic evidence involving species affected by the same geographical barriers, e.g. lizards of the genera *Corucia* Gray, 1855 and *Tribolonotus* Duméril and Bibron, 1839 as detailed by Austin *et al.* (2010) and Hagen *et al.* (2012), and the geological evidence of relevance, it is clear that the relevant forms are sufficiently divergent to warrant taxonomic recognition.

Thus five distinctive forms are herein given taxonomic recognition as full species. Other than *Loveridegelaps elapoides* (Boulenger, 1890), none have available names and so four are named for the first time according to the provisions of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

These are: *Loveridgelaps sloppi* sp. nov. from the New Georgia Group of Islands. *L. josephburkei* sp. nov. from the Shortland Islands, *L. yeomansi* sp. nov. from Guadalcanal and *L. fiacummingae* sp. nov. from Malaita.

**Keywords:** Taxonomy; snakes; genus; *Loveridgelaps*; species; *elapoides*; Boulenger; Solomon Islands; Solomons; Guadalcanal; Ngela; Nggela, Malaita; Shortland Island; New Georgia; Gizo; Santa Isabel; Florida Islands; Bougainville; new species; *sloppi*; *josephburkei*; *yeomansi*; *fiacummingae*.

**INTRODUCTION**

The Solomons Black-banded Krait was originally described as *Hoplocephalus elapoides* Boulenger, 1890, from a specimen caught on Florida Island in the Solomon Islands.

It was transferred to a newly created monotypic genus *Loveridegelaps* by McDowell in 1970 on the basis of significant morphological differences to all other elapid species.

Hoser (2012), assigned this and related species to a relevant tribe and subtribe, Micropechiini and Loveridgelapina respectively.

Since the original description widely divergent specimens have been found across most major island groups within the Solomon Islands.

However, until now no herpetologist has considered whether or not there is more than one species currently under this umbrella.

Inspection of specimens from the majority of islands *Loveridegelaps* have been found shows significant variation

between specimens and of sufficient basis to warrant division into separate species.

This includes consistent differences in scalation, colouration and hemipene morphology and can be reliably used to separate each form, including the substantial body of evidence published by McDowell (1970), who also inspected a number of specimens from across the Solomon Islands.

As a result, of an assessment of the snakes and the relevant available genetic evidence involving species affected by the same geographical barriers, e.g. lizards of the genera *Corucia* Gray, 1855 and *Tribolonotus* Duméril and Bibron, 1839 as detailed by Austin *et al.* (2010) and Hagen *et al.* (2012), and the geological evidence of relevance, it is clear that the relevant forms are sufficiently divergent to warrant taxonomic recognition.

They are clearly morphologically distinct, have significant divergences with respect to very conservative characters, such as hemipene morphology, indicating deep divergence and based

on parallel studies involving species affected by the same barriers, clearly form genetically distinct, separately evolving populations.

Thus five distinctive forms are herein given taxonomic recognition as full species. Other than *Loveridgegelps elapoides* (Boulenger, 1890), none have available names and so four are named for the first time according to the provisions of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

These are: *Loveridgegelps sloppi sp. nov.* from the New Georgia Group of Islands. *L. josephburkei sp. nov.* from the Shortland Islands, *L. yeomansi sp. nov.* from Guadalcanal and *L. fiacummingae sp. nov.* from Malaita.

It should also be noted that at the time of McDowell's (1970) study, he was isolated from molecular studies not available at the time and therefore could only speculate as to the taxonomic significance of divergent traits he observed and documented.

However prior to the publication of this paper I was able to match this evidence with what is now well known about the recent geological past, in terms of ice-age maxima, changing sea levels and climates and the roles these play in speciation, either in these relevant snakes or other reptile taxa affected by the same factors.

Divergences were ascertained on the basis of previous ice-age maxima connections between relevant islands as explained by authors such as Bruns *et al.* (2009), Russell and Coupe (1984) and recent molecular studies on both *Corucia* Gray, 1856 and *Tribolonotus* Duméril and Bibron, 1839 as published by Austin *et al.* (2010) and Hagen *et al.* (2012), and the relevant sources cited within.

Notwithstanding the theft of relevant materials from this author in an illegal armed raid on 17 August 2011, which were not returned (Court of Appeal Victoria 2014 and VCAT 2015) and not returned in breach of various earlier court orders, I have made a decision to publish this paper in view of the conservation significance attached to the formal recognition of unnamed species and on the basis that further delays may in fact put these otherwise unnamed taxa at greater risk of extinction.

I also note that Boseto and Pikacha (2016), wrote of a serious alleged decline in abundance of *Loveridgegelps* in recent years, meaning the species in the genus are at heightened risk.

They wrote: "Locals from Sasamugga also claimed that the rare and poorly known *Loveridgegelps elapoides*, one of the two terrestrial elapid snake species that has been previously documented on Choiseul, was once common in the Sirebe Rainforest area, but that the arrival of *R. marina* caused it to decline dramatically."

Thus five distinctive forms are herein given taxonomic recognition on the basis that likely divergences exceed the timeline determined as significant by Keogh *et al.* (2003).

Rafting between islands is not viewed as a significant means of dispersal or ongoing gene flow, beyond times of initial colonisation for reasons given by Hagen *et al.* (2012) and Balsai (1995) and also due to the absence of the genus from nearby island archipelagos beyond the Bougainville group.

Of relevance also is that the islands Guadalcanal and Malaita are separated from one another and the others by a sea depth of more than 200 metres and hence do not appear to have been joined at any stage in the last 5 million years.

#### MATERIALS AND METHODS

These are not formally explained in a number of my recent papers under the heading "Materials and methods" or similar, on the basis they are self evident to any vaguely perceptive reader. However, the process by which the following taxonomy and nomenclature in this and other recent papers by myself of similar form, has been arrived at, is explained herein for the benefit of people who have recently published so-called "criticisms" online of some of my recent papers. They have alleged a serious "defect" by myself not formally explaining

"Materials And Methods" under such a heading.

The process involved in creating the final product for this and other relevant papers has been via a combination of the following:

Genera and component species are audited to see if their classifications are correct on the basis on known type specimens, locations and the like when compared with known phylogenies and obvious morphological differences between like species.

Original descriptions and contemporary concepts of the species are matched with available specimens from across the ranges of the species to see if all conform to accepted norms.

These may include those held in museums, private collections, collected in the field, photographed, posted on the internet or held by individuals, and only when the location data is good and any other relevant data available.

Where specimens do not appear to comply with the described species (and accepted concept of the species), this non-conformation is looked at with a view to ascertaining if it is worthy of taxonomic recognition or other relevant considerations on the basis of differences that can be tested for antiquity or deduced from earlier studies.

When this appears to be the case (non-conformation), the potential target taxon is inspected as closely as practicable with a view to comparing with the nominate form or forms if other similar taxa have been previously named.

Other relevant data is also inspected, including any available molecular studies which may indicate likely divergence of populations.

Where molecular studies are unavailable for the relevant taxon or group, other studies involving species and groups constrained by the same geographical or geological barriers, or with like distribution patterns are inspected as they give reasonable indications of the likely divergences of the taxa being studied herein.

Additionally other studies involving geological history, sea level and habitat changes associated with long-term climate change, including recent ice age changes in sea levels, versus known sea depths are utilized to predict past movements of species and genus groups in order to further ascertain likely divergences between extant populations (as done in this very paper).

When all available information checks out to show taxonomically distinct populations worthy of recognition, they are then recognized herein according to the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

This means that if a name has been properly proposed in the past, it is used. This is exactly what happens in this paper for the taxon originally described as *Hoplocephalus elapoides* Boulenger, 1890.

Alternatively, if no name is available, one is proposed according to the rules of the Code as is done four times in this paper.

As a matter of trite I mention that if a target taxon or group does check out as being "in order" or properly classified, a paper is usually not published unless some other related taxon is named for the first time.

The published literature relevant to the taxonomic judgements made within this paper includes papers relevant to Solomon Islands species affected by the same physical barriers to dispersion as well as those directly relevant to *Loveridgegelps* and combined, they include the following:

Adler *et al.* (1995), Austin *et al.* (2010), Balsai (1995), Barbour (1921), Boseto and Pikacha (2016), Boulenger (1884, 1886, 1890), Bruns *et al.* (1989), Cogger (1972), Dahl (1986), Duméril and Bibron (1839), Gray (1856), Greer (1982), Greer and Parker (1967), Greer and Simon (1982), Hagen *et al.* (2012), Hall (2002), Iskandar and Erdelen (2006), Keogh *et al.* (2003), Kinghorn (1928, 1937), McCoy (1980, 2006), McDowell (1970), Mys (1988), Ogilby (1890), Pianka and Vitt (2003), Pyron *et al.*

(2013), Reeder (2003), Rittmeyer and Austin (2015), Russell and Coupe (1984), Schmidt (1932), Williams and Parker (1964), Zweifel (1966), and sources cited therein.

Some material within descriptions below is repeated for different described taxa and this is in accordance with the provisions of the *International Code of Zoological Nomenclature* and the legal requirements for each description. I make no apologies for this.

#### GENUS *LOVERIDGELAPS* McDOWELL, 1970.

**Type species:** *Hoplocephalus elapoides* Boulenger, 1890.

**Diagnosis:** *Loveridgelaps* McDowell, 1970 is defined in detail by McDowell (1970) and this diagnosis is adopted herein as correct for the genus.

In summary the genus is defined as follows: Head slightly flattened and barely distinct from the neck. Eyes very small and a diagnostic difference between this and other Solomon Islands elapids. Nasal is single or divided which contacts the preocular. Rostral broad, frontal is as wide as long and wider than the supraoculars. 7 supralabials, with numbers 3 and 4 entering the eye. 1 or 2 postoculars. Temporals 1+2. Body is of moderate shape and size is to about 1 meter in total length in adults.

17 Mid body rows, 193-218 ventrals, anal entire and 31-38 all divided subcaudals.

The dorsal colouration is black with a regular series of bright yellow bands along the vertebral line. Laterally the banding is white, usually separated from the yellow bands by one or two rows of black scales. The head is usually white with irregular black markings on the rostral, labials, orbits and sometimes the occiput. Some melanotic forms are known.

**Distribution:** Endemic to the Solomon Islands Archipelago, including: Shortland, Choiseul, Santa Isabel, Rob Roy, Vella Lavella, Gizo, Guadalcanal, Ngela (AKA Nggela) or Florida Islands, Malaita.

**Content:** *Loveridgelaps elapoides* (Boulenger, 1890) (type species); *L. sloppi* sp. nov.; *L. josephburkei* sp. nov.; *L. yeomansi* sp. nov.; *L. fiacummingae* sp. nov..

#### *LOVERIDGELAPS ELAPOIDES* BOULENGER, 1890.

**Holotype:** A specimen at the Natural History Museum, London, UK, specimen number, BM 1946. 1.18.98 (originally, 89.3.29.191) collected at Florida Islands, Solomon Islands.

**Diagnosis:** *Loveridgelaps elapoides* (Boulenger, 1890) from the Florida Islands Group, Santa Isabel and Choiseul is separated from all other *Loveridgelaps* McDowell, 1970 (excluding *L. josephburkei* sp. nov.), by the following suite of characters: The snout and ocular region are black, although the rest of the head and anteriormost neck are yellowish white, with or without a pair of small black spots on the occipital region of the head, behind the parietals. The black crossbands are of nearly equal width laterally and vertically, about five or six scale-lengths wide and separated by yellowish zones about three to four scales wide. Posteriorly, the pale zones contain black spots, and the black crossbands extend onto the tips of the ventrals and encircle the tail to form rings.

*L. elapoides* is separated from all other *Loveridgelaps* by having a belly that is either unmarked and unspotted (Florida Islands animals) or with considerable black spotting except on the forebody (Choiseul and Santa Isabel).

*L. josephburkei* sp. nov. known only from the Shortland Islands is similar in most respects to *L. elapoides* which it would otherwise be identified as, but differs from it by having small black spots, flecks and markings on the lower belly, but not on the mid-belly, and in not alternatively having an unmarked belly.

For *L. elapoides* there are about 22 crossbands on the body and tail, (Florida Islands animals) or 34 (Choiseul and Santa Isabel).

The hemipenis in male *L. elapoides* is unique for *Loveridgelaps* in the following properties: The everted organ extends to subcaudal nine, (versus 6 in *Loveridgelaps sloppi* sp. nov. from the New Georgia Group of Islands; 10 in *L. yeomansi* sp. nov. from Guadalcanal and 7-8 in *L. fiacummingae* sp. nov. from

Malaita). In common with *L. fiacummingae* sp. nov. the hemipenis of *L. elapoides* is forked at subcaudal 7 or 8, versus 6 in *L. sloppi* sp. nov. and 9 in *L. yeomansi* sp. nov.. The sulcus is forked at subcaudals 5-8 in all species, but usually 7 in *L. elapoides*.

**Distribution:** Restricted to the Florida Islands, Santa Isabel and Choiseul.

#### *LOVERIDGELAPS SLOPPI* SP. NOV.

**Holotype:** A male specimen at the Museum of Natural History, London, UK, specimen number: 1933.3.4.2, from Gizo Island in the New Georgia group of islands in the Solomon Islands.

The Museum of Natural History, London, UK is a facility that allows access to its holdings.

**Diagnosis:** *Loveridgelaps sloppi* sp. nov. from the New Georgia group of islands is separated from all other *Loveridgelaps* McDowell, 1970, by the following suite of characters: The entire head and anteriormost neck are yellowish white, except for a few dark flecks on the internasals and rostral and a narrow black border around each eye and nostril; the black crossbands are noticeably narrow laterally, but about five scale-lengths wide vertically, where the separating orange-yellowish white zones are two or three scale-lengths wide. There are 42 dark crossbands on the body and tail, versus never more than 34 in any other species of *Loveridgelaps*.

The pale zones and belly lack scattered black pigment, although the black crossbands extend onto the tips of the ventrals and completely traverse the subcaudals to form rings.

The hemipenis in male *L. sloppi* sp. nov. is unique for *Loveridgelaps* in the following properties: everted organ length to subcaudal 6 (versus 7 or more in all other species), forked at subcaudal 6 (versus 7 or more in all other species) and sulcus is forked at subcaudal 5 (in common with *L. fiacummingae* sp. nov. from Malaita).

*Loveridgelaps elapoides* (Boulenger, 1890) from the Florida Islands Group, Santa Isabel and Choiseul is separated from all other *Loveridgelaps* McDowell, 1970 (excluding *L. josephburkei* sp. nov.), by the following suite of characters: The snout and ocular region are black, although the rest of the head and anteriormost neck are yellowish white, with or without a pair of small black spots on the occipital region of the head, behind the parietals. The black crossbands are of nearly equal width laterally and vertically, about five or six scale-lengths wide, and separated by yellowish zones about three to four scales wide. Posteriorly, the pale zones contain black spots, and the black crossbands extend onto the tips of the ventrals and encircle the tail to form rings.

*L. elapoides* is separated from all other *Loveridgelaps* by having a belly that is either unmarked and unspotted (Florida Islands animals) or with considerable black spotting except on the forebody (Choiseul and Santa Isabel).

For *L. elapoides* there are about 22 crossbands on the body and tail, (Florida Islands animals) or 34 (Choiseul and Santa Isabel).

The hemipenis in male *L. elapoides* is unique for *Loveridgelaps* in the following properties: The everted organ extends to subcaudal nine, (versus 6 in *Loveridgelaps sloppi* sp. nov. from the New Georgia Group of Islands; 10 in *L. yeomansi* sp. nov. from Guadalcanal and 7-8 in *L. fiacummingae* sp. nov. from Malaita). In common with *L. fiacummingae* sp. nov. the hemipenis of *L. elapoides* is forked at subcaudal 7 or 8, versus 6 in *L. sloppi* sp. nov. and 9 in *L. yeomansi* sp. nov.. The sulcus is forked at subcaudals 5-8 in all species, but usually 7 in *L. elapoides*.

*L. josephburkei* sp. nov. known only from the Shortland Islands is similar in most respects to *L. elapoides* which it would otherwise be identified as, but differs from it by having small black spots, flecks and markings on the lower belly, but not on the mid-belly, and in not alternatively having an unmarked belly.

*L. yeomansi* sp. nov. from Guadalcanal is separated from all



other *Loveridgelaps* McDowell, 1970, by the following suite of characters: Head as in *L. elapoides*, but black occipital spots expanded into large blotches that extend nearly or to the edges of the parietals. The black crossbands are about four to six scale-lengths wide, and the light zones may or may not contain some black spotting, but not so much as to connect the black bands. The belly has a small amount of black spotting, and the black crossbands impinge extensively on the ventrals (so that the last one or two bands on the body may be complete rings, like those of the tail). The crossbands are moderate in number (28 to 33 on body and tail).

The hemipenis in male *L. yeomansi* sp. nov. is unique for *Loveridgelaps* in the following properties: its length when everted is 10 subcaudals (versus 9 or less for all other species), it is forked at subcaudal number 9, versus 8 or less for all other species, and the sulcus is forked at subcaudal number 7 or 8.

*L. fiacummingae* sp. nov. from Malaita is separated from all other *Loveridgelaps* McDowell, 1970, by the following suite of characters: The colouration noticeably tends towards being melanotic as described by both McCoy (2006) and McDowell (1970). In more detail, the black occipital blotches extend well onto the parietals and become confluent with the black ocular regions and with one another, thus isolating the white area on the frontal as an irregular pale crown patch. The dark crossbands are very broad, but become narrower laterally, and tend to fuse with one another through connection with the black pigment in the whitish zones, which makes the counting of blotches somewhat arbitrary; the pale zones are reduced in width to one scale-length vertebrally. The belly is white and without flecks or blotches, but the tail is encircled by black rings. Hemipene characteristics for *L. fiacummingae* sp. nov. appear within the mid-range for the genus, reaching to subcaudal 7 or 8 when fully everted, versus 6 in *L. sloppi* sp. nov., 9 in *L. elapsoides* and 10 in *L. yeomansi* sp. nov..

**Distribution:** *L. sloppi* sp. nov. is restricted to the New Georgia Group of Islands in the Solomon Islands.

**Etymology:** Named in honour of our living Great Dane (dog), named "Slopp" for services to educating people about being nice to animals, via our live animal shows and displays business.

**LOVERIDGELAPS JOSPEHBURKEI SP. NOV.**

**Holotype:** A specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R.126267, from Near Harehare Village, Shortland Island, Solomon Islands (7°03' S, 155°52' E).

The Australian Museum, Sydney, NSW, Australia is a facility that allows access to its holdings.

**Diagnosis:** *L. josephburkei* sp. nov. known only from the Shortland Islands is similar in most respects to *L. elapoides* which it would otherwise be identified as, but differs from it by having small black spots, flecks and markings on the lower belly, but not on the mid-belly, and in not alternatively having an unmarked belly.

The hemipenes in male *L. josephburkei* sp. nov. are essentially similar to those of *L. elapoides*.

*Loveridgelaps elapoides* (Boulenger, 1890) from the Florida Islands Group, Santa Isabel and Choiseul is separated from all other *Loveridgelaps* McDowell, 1970 (excluding *L. josephburkei* sp. nov.), by the following suite of characters: The snout and ocular region are black, although the rest of the head and anteriormost neck are yellowish white, with or without a pair of small black spots on the occipital region of the head, behind the parietals. The black crossbands are of nearly equal width laterally and vertebrally, about five or six scale-lengths wide, and separated by yellowish zones about three to four scales wide. Posteriorly, the pale zones contain black spots, and the black crossbands extend onto the tips of the ventrals and encircle the tail to form rings.

*L. elapoides* is separated from all other *Loveridgelaps* by having a belly that is either unmarked and unspotted (Florida Islands

animals) or with considerable black spotting except on the forebody (Choiseul and Santa Isabel). There are anywhere from 22 to 34 crossbands on the body and tail.

The hemipenis in male *L. elapoides* is unique for *Loveridgelaps* in the following properties: The everted organ extends to subcaudal nine, (versus 6 in *Loveridgelaps sloppi* sp. nov. from the New Georgia Group of Islands; 10 in *L. yeomansi* sp. nov. from Guadalcanal and 7-8 in *L. fiacummingae* sp. nov. from Malaita). In common with *L. fiacummingae* sp. nov. the hemipenis of *L. elapoides* is forked at subcaudal 7 or 8, versus 6 in *L. sloppi* sp. nov. and 9 in *L. yeomansi* sp. nov.. The sulcus is forked at subcaudals 5-8 in all species, but usually 7 in *L. elapoides*.

*Loveridgelaps sloppi* sp. nov. from the New Georgia group of islands is separated from all other *Loveridgelaps* McDowell, 1970, by the following suite of characters: The entire head and anteriormost neck are yellowish white, except for a few dark flecks on the internasals and rostral and a narrow black border around each eye and nostril; the black crossbands are noticeably narrow laterally, but about five scale-lengths wide vertebrally, where the separating orange-yellowish white zones are two or three scale-lengths wide. There are 42 dark crossbands on the body and tail, versus never more than 34 in any other species of *Loveridgelaps*. The pale zones and belly lack scattered black pigment, although the black crossbands extend onto the tips of the ventrals and completely traverse the subcaudals to form rings.

The hemipenis in male *L. sloppi* sp. nov. is unique for *Loveridgelaps* in the following properties: everted organ length to subcaudal 6 (versus 7 or more in all other species), forked at subcaudal 6 (versus 7 or more in all other species) and sulcus is forked at subcaudal 5 (in common with *L. fiacummingae* sp. nov. from Malaita).

*L. yeomansi* sp. nov. from Guadalcanal is separated from all other *Loveridgelaps* McDowell, 1970, by the following suite of characters: Head as in *L. elapoides*, but black occipital spots expanded into large blotches that extend nearly or to the edges of the parietals. The black crossbands are about four to six scale-lengths wide, and the light zones may or may not contain some black spotting, but not so much as to connect the black bands. The belly has a small amount of black spotting, and the black crossbands impinge extensively on the ventrals (so that the last one or two bands on the body may be complete rings, like those of the tail). The crossbands are moderate in number (28 to 33 on body and tail).

The hemipenis in male *L. yeomansi* sp. nov. is unique for *Loveridgelaps* in the following properties: its length when everted is 10 subcaudals (versus 9 or less for all other species), it is forked at subcaudal number 9, versus 8 or less for all other species, and the sulcus is forked at subcaudal number 7 or 8.

*L. fiacummingae* sp. nov. from Malaita is separated from all other *Loveridgelaps* McDowell, 1970, by the following suite of characters: The colouration noticeably tends towards being melanotic as described by both McCoy (2006) and McDowell (1970). In more detail, the black occipital blotches extend well onto the parietals and become confluent with the black ocular regions and with one another, thus isolating the white area on the frontal as an irregular pale crown patch. The dark crossbands are very broad, but become narrower laterally, and tend to fuse with one another through connection with the black pigment in the whitish zones, which makes the counting of blotches somewhat arbitrary; the pale zones are reduced in width to one scale-length vertebrally. The belly is white and without flecks or blotches, but the tail is encircled by black rings. Hemipene characteristics for *L. fiacummingae* sp. nov. appear within the mid-range for the genus, reaching to subcaudal 7 or 8 when fully everted, versus 6 in *L. sloppi* sp. nov., 9 in *L. elapsoides* and 10 in *L. yeomansi* sp. nov..

**Distribution:** Known only from the Shortland Islands, Solomon

Islands, but may also occur elsewhere in the Bougainville group of islands.

**Eymology:** Named in honour of Joseph Burke of Joseph Burke Law, Melbourne, Victoria in recognition of his services to the administration of justice in Melbourne, Australia, by defending people against improper attacks from corrupt government employees.

**LOVERIDGELAPS YEOMANSI SP. NOV.**

**Holotype:** A specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R.118881 from Guadalcanal, Solomon Islands (9°32'S, 160°12'E). The Australian Museum, Sydney, NSW, Australia is a facility that allows access to its holdings.

**Paratypes:** A specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R.9301, from Guadalcanal, Solomon Islands (9°32'S, 160°12'E).

A female specimen at the Museum of Comparative Zoology, Harvard University, USA, specimen number: MCZ 66899 from Guadalcanal, Solomon Islands.

A male specimen at the Museum of Natural History, London, UK, specimen number: 1936.10.4.64 from Guadalcanal, Solomon Islands.

A female specimen at the Museum of Natural History, London, UK, specimen number: 1967.834 from Guadalcanal, Solomon Islands.

**Diagnosis:** *L. yeomansi sp. nov.* from Guadalcanal is separated from all other *Loveridgelaps* McDowell, 1970, by the following suite of characters: Head as in *L. elapoides*, but black occipital spots expanded into large blotches that extend nearly or to the edges of the parietals. The black crossbands are about four to six scale-lengths wide, and the light zones may or may not contain some black spotting, but not so much as to connect the black bands. The belly has a small amount of black spotting and the black crossbands impinge extensively on the ventrals (so that the last one or two bands on the body may be complete rings, like those of the tail). The crossbands are moderate in number (28 to 33 on body and tail).

The hemipenis in male *L. yeomansi sp. nov.* is unique for *Loveridgelaps* in the following properties: its length when everted is 10 subcaudals (versus 9 or less for all other species), it is forked at subcaudal number 9, versus 8 or less for all other species, and the sulcus is forked at subcaudal number 7 or 8.

*Loveridgelaps elapoides* (Boulenger, 1890) from the Florida Islands Group, Santa Isabel and Choiseul is separated from all other *Loveridgelaps* McDowell, 1970 (excluding *L. josephburkei sp. nov.*), by the following suite of characters: The snout and ocular region are black, although the rest of the head and anteriormost neck are yellowish white, with or without a pair of small black spots on the occipital region of the head, behind the parietals. The black crossbands are of nearly equal width laterally and vertebally, about five or six scale-lengths wide and separated by yellowish zones about three to four scales wide. Posteriorly, the pale zones contain black spots, and the black crossbands extend onto the tips of the ventrals and encircle the tail to form rings.

*L. elapoides* is separated from all other *Loveridgelaps* by having a belly that is either unmarked and unspotted (Florida Islands animals) or with considerable black spotting except on the forebody (Choiseul and Santa Isabel).

For *L. elapoides* there are about 22 crossbands on the body and tail, (Florida Islands animals) or 34 (Choiseul and Santa Isabel).

The hemipenis in male *L. elapoides* is unique for *Loveridgelaps* in the following properties: The everted organ extends to subcaudal nine, (versus 6 in *Loveridgelaps sloppi sp. nov.* from the New Georgia Group of Islands; 10 in *L. yeomansi sp. nov.* from Guadalcanal and 7-8 in *L. fiacummingae sp. nov.* from Malaita). In common with *L. fiacummingae sp. nov.* the hemipenis of *L. elapoides* is forked at subcaudal 7 or 8, versus 6

in *L. sloppi sp. nov.* and 9 in *L. yeomansi sp. nov.*. The sulcus is forked at subcaudals 5-8 in all species, but usually 7 in *L. elapoides*.

*L. josephburkei sp. nov.* known only from the Shortland Islands is similar in most respects to *L. elapoides* which it would otherwise be identified as, but differs from it by having small black spots, flecks and markings on the lower belly, but not on the mid-belly, and in not alternatively having an unmarked belly.

*Loveridgelaps sloppi sp. nov.* from the New Georgia group of islands is separated from all other *Loveridgelaps* McDowell, 1970, by the following suite of characters: The entire head and anteriormost neck are yellowish white, except for a few dark flecks on the internasals and rostral and a narrow black border around each eye and nostril; the black crossbands are noticeably narrow laterally, but about five scale-lengths wide vertebally, where the separating orange-yellowish white zones are two or three scale-lengths wide. There are 42 dark crossbands on the body and tail, versus never more than 34 in any other species of *Loveridgelaps*.

The pale zones and belly lack scattered black pigment, although the black crossbands extend onto the tips of the ventrals and completely traverse the subcaudals to form rings.

The hemipenis in male *L. sloppi sp. nov.* is unique for *Loveridgelaps* in the following properties: everted organ length to subcaudal 6 (versus 7 or more in all other species), forked at subcaudal 6 (versus 7 or more in all other species) and sulcus is forked at subcaudal 5 (in common with *L. fiacummingae sp. nov.* from Malaita).

*L. fiacummingae sp. nov.* from Malaita is separated from all other *Loveridgelaps* McDowell, 1970, by the following suite of characters: The colouration noticeably tends towards being melanotic as described by both McCoy (2006) and McDowell (1970). In more detail, the black occipital blotches extend well onto the parietals and become confluent with the black ocular regions and with one another, thus isolating the white area on the frontal as an irregular pale crown patch. The dark crossbands are very broad, but become narrower laterally, and tend to fuse with one another through connection with the black pigment in the whitish zones, which makes the counting of blotches somewhat arbitrary; the pale zones are reduced in width to one scale-length vertebally. The belly is white and without flecks or blotches, but the tail is encircled by black rings.

Hemipene characteristics for *L. fiacummingae sp. nov.* appear within the mid-range for the genus, reaching to subcaudal 7 or 8 when fully everted, versus 6 in *L. sloppi sp. nov.*, 9 in *L. elapoides* and 10 in *L. yeomansi sp. nov.*

**Distribution:** Guadalcanal Island in the Solomon Islands.

**Eymology:** Named in honour of now deceased UK herpetologist, Luke Yeomans. For details relating to the etymology, see Hoser (2012).

**LOVERIDGELAPS FIACUMMINGAE SP. NOV.**

**Holotype:** A male specimen at the American Museum of Natural History (AMNH), New York, USA, specimen number: AMNH 43399, from Malaita, Solomon Islands.

The American Museum of Natural History (AMNH), New York, USA, is a facility that allows access to its holdings.

**Paratypes:** 1/ A male specimen at the American Museum of Natural History (AMNH), New York, USA, specimen number: AMNH 43400, from Malaita, Solomon Islands.

2/ A specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R.2379 from Malaita, Solomon Islands (9°00'S, 161°00'E).

3/ A specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R.87382 from within a 3km radius of Bitaaama, North Malaita, Solomon Islands (8°24'S, 160°36'E).

**Diagnosis:** *L. fiacummingae sp. nov.* from Malaita is separated from all other *Loveridgelaps* McDowell, 1970, by the following suite of characters: The colouration noticeably tends towards

being melanotic as described by both McCoy (2006) and McDowell (1970), separating this taxon from others in the genus. In more detail, the black occipital blotches extend well onto the parietals and become confluent with the black ocular regions and with one another, thus isolating the white area on the frontal as an irregular pale crown patch. The dark crossbands are very broad, but become narrower laterally, and tend to fuse with one another through connection with the black pigment in the whitish zones, which makes the counting of blotches somewhat arbitrary; the pale zones are reduced in width to one scale-length vertebrally. The belly is white and without flecks or blotches, but the tail is encircled by black rings.

Hemipene characteristics for *L. fiacummingae* sp. nov. appear within the mid-range for the genus, reaching to subcaudal 7 or 8 when fully everted, versus 6 in *L. sloppi* sp. nov., 9 in *L. elapoides* and 10 in *L. yeomansi* sp. nov..

*Loveridgelaps elapoides* (Boulenger, 1890) from the Florida Islands Group, Santa Isabel and Choiseul is separated from all other *Loveridgelaps* McDowell, 1970 (excluding *L. josephburkei* sp. nov.), by the following suite of characters: The snout and ocular region are black, although the rest of the head and anteriormost neck are yellowish white, with or without a pair of small black spots on the occipital region of the head, behind the parietals. The black crossbands are of nearly equal width laterally and vertebrally, about five or six scale-lengths wide, and separated by yellowish zones about three to four scales wide. Posteriorly, the pale zones contain black spots, and the black crossbands extend onto the tips of the ventrals and encircle the tail to form rings.

*L. elapoides* is separated from all other *Loveridgelaps* by having a belly that is either unmarked and unspotted (Florida Islands animals) or with considerable black spotting except on the forebody (Choiseul and Santa Isabel).

For *L. elapoides* there are about 22 crossbands on the body and tail, (Florida Islands animals) or 34 (Choiseul and Santa Isabel).

The hemipenis in male *L. elapoides* is unique for *Loveridgelaps* in the following properties: The everted organ extends to subcaudal nine, (versus 6 in *Loveridgelaps sloppi* sp. nov. from the New Georgia Group of Islands; 10 in *L. yeomansi* sp. nov. from Guadalcanal and 7-8 in *L. fiacummingae* sp. nov. from Malaita). In common with *L. fiacummingae* sp. nov. the hemipenis of *L. elapoides* is forked at subcaudal 7 or 8, versus 6 in *L. sloppi* sp. nov. and 9 in *L. yeomansi* sp. nov.. The sulcus is forked at subcaudals 5-8 in all species, but usually 7 in *L. elapoides*.

*L. josephburkei* sp. nov. known only from the Shortland Islands is similar in most respects to *L. elapoides* which it would otherwise be identified as, but differs from it by having small black spots, flecks and markings on the lower belly, but not on the mid-belly, and in not alternatively having an unmarked belly.

*Loveridgelaps sloppi* sp. nov. from the New Georgia group of islands is separated from all other *Loveridgelaps* McDowell, 1970, by the following suite of characters: The entire head and anteriormost neck are yellowish white, except for a few dark flecks on the internasals and rostral and a narrow black border around each eye and nostril; the black crossbands are noticeably narrow laterally, but about five scale-lengths wide vertebrally, where the separating orange-yellowish white zones are two or three scale-lengths wide. There are 42 dark crossbands on the body and tail, versus never more than 34 in any other species of *Loveridgelaps*. The pale zones and belly lack scattered black pigment, although the black crossbands extend onto the tips of the ventrals and completely traverse the subcaudals to form rings.

The hemipenis in male *L. sloppi* sp. nov. is unique for *Loveridgelaps* in the following properties: everted organ length to subcaudal 6 (versus 7 or more in all other species), forked at subcaudal 6 (versus 7 or more in all other species) and sulcus is forked at subcaudal 5 (in common with *L. fiacummingae* sp. nov. from Malaita).

*L. yeomansi* sp. nov. from Guadalcanal is separated from all other *Loveridgelaps* McDowell, 1970, by the following suite of characters: Head as in *L. elapoides*, but black occipital spots expanded into large blotches that extend nearly or to the edges of the parietals. The black crossbands are about four to six scale-lengths wide, and the light zones may or may not contain some black spotting, but not so much as to connect the black bands. The belly has a small amount of black spotting, and the black crossbands impinge extensively on the ventrals (so that the last one or two bands on the body may be complete rings, like those of the tail). The crossbands are moderate in number (28 to 33 on body and tail).

The hemipenis in male *L. yeomansi* sp. nov. is unique for *Loveridgelaps* in the following properties: its length when everted is 10 subcaudals (versus 9 or less for all other species), it is forked at subcaudal number 9, versus 8 or less for all other species, and the sulcus is forked at subcaudal number 7 or 8.

**Distribution:** Malaita Island in the Solomon Islands.

**Etymology:** Named in honour of Fia Cumming, former investigative journalist, of Lyons, ACT, Australia, formerly of Chatswood, NSW, for her enormous contributions to wildlife conservation in Australia as detailed in the book *Smuggled-2: wildlife Trafficking, Crime and Corruption in Australia* (Hoser, 1996).

The previous naming of one or more taxa in her honour as "cummingi" in the masculine, was deliberate as in Australian slang language "it took balls", an alleged male quality to take the enormous personal risks and costs she endured when publishing her detailed expose's of wildlife crime in Australia, and so the name "cummingi" as proposed by Hoser (1998) and/or elsewhere, should not be amended unless mandatory according to the rules of the *International Code of Zoological Nomenclature* (Ride et al. 1999).

#### NOTES ON THE DESCRIPTIONS FOR ANY POTENTIAL REVISORS

Unless mandated by the rules of the *International Code of Zoological Nomenclature*, none of the spellings of the newly proposed names should be altered in any way. Should one or more newly named taxa be merged by later authors to be treated as single species, the order of priority of retention of names should be as follows: *sloppi*; *josephburkei*; *yeomansi*; *fiacummingae*, which is the order (page priority) of the descriptions within this text.

#### REFERENCES CITED

- Adler, G. H., Austin, C. C. and Dudley, R. 1995. Dispersal and speciation of skinks among archipelagos in the tropical Pacific Ocean. *Evolutionary Ecology* 9:529-541.
- Austin, C. C., Rittmeyer, E. N., Richards, S. J. and Zug, G. R. 2010. Phylogeny, historical biogeography and body size evolution in Pacific Island Crocodile skinks *Tribolonotus* (Squamata: Scincidae). *Molecular Phylogenetics and Evolution* 57(1):227-236.
- Balsai, M. J. 1995. Husbandry and Breeding of the Solomon Islands Prehensile-tailed Skink, *Corucia zebrata*. *The Vivarium* 7(1):4-11.
- Barbour, T. 1921. Reptiles and amphibians from the British Solomon Islands. *Proc. New England zool. Club* 7:91-112.
- Boseto, D. and Pikacha, P. (eds) 2016. A report on baseline biodiversity inventory of Mount Maetambe to Kolobangara River Corridor, Choiseul Island, Solomon Islands. Downloaded from the website of Ecological Solutions Solomon Islands at: <http://ecologicalsolutions-si.com/files/110494600.pdf>
- Boulenger, G. A. 1884. Diagnoses of new reptiles and batrachians from the Solomon Islands, collected and presented to the British Museum by H. B. Guppy, Esq., M. B., H. M. S. 'Lark.'. *Proc. Zool. Soc. London* 1884:210-213.
- Boulenger, G. A. 1886. On the reptiles and batrachians of the Solomon Islands. *Trans. Zool. Soc. London* 12:35-62.

- Boulenger, G. A. 1890. Fourth contribution to the herpetology of the Solomon Islands. *Proc. Zool. Soc. London* 1890:30-31.
- Bruns, T. R., Vedder, J. R. and Cooper, A. K. 1989. Geology of the Shortland Basin Region, Central Solomons Trough, Solomon Islands - Review and New Findings. pp. 125-144 in Vedder, J.G., and Bruns, T. R., (editors), 1989. *Geology and offshore resources of Pacific island arcs Solomon Islands and Bougainville, Papua New Guinea Regions*. Houston, Texas, Circum-Pacific Council for Energy and Mineral Resources, Earth Science Series, v. 12.
- Cogger, H. G. 1972. A new scincid lizard of the genus *Tribolonotus* from Manus Island, New Guinea. *Zool. Mededelingen* 47:202-210.
- Court of Appeal Victoria. 2014. Hoser v Department of Sustainability and Environment [2014] VSCA 206 (5 September 2014).
- Dahl, A. L. 1986. *Review of the protected areas system in Oceania*. IUCN/UNEP, Gland, Switzerland.
- Duméril, A. M. C. and Bibron, G. 1839. *Erpétologie Générale ou Histoire Naturelle Complète des Reptiles*. Vol.5. Roret/Fain et Thunot, Paris:871 pp.
- Gray, J. E. 1856. New genus of fish-scaled lizards (Scissosarae) from New Guinea. *Ann. Mag. Nat. Hist.* (2)18:345-346.
- Greer, A. E. 1982. A new species of *Geomyersia* (Scincidae) from the Admiralty Islands, with a summary of the genus. *Journal of Herpetology* 16(1):61-66.
- Greer, A. E. and Parker, F. 1967. A new scincid lizard from the northern Solomon Islands. *Breviora* (275):1-20.
- Greer, A. E. and Simon, M. 1982. *Fojia bumui*, an unusual new genus and species of scincid lizard from New Guinea. *Journal of Herpetology* 16(2):131-139.
- Hagen, I. J., Donnellan, S. C. and Bull, M. 2012. Phylogeography of the prehensile-tailed skink *Corucia zebrata* on the Solomon Archipelago. *Ecology and Evolution* (2012), 2(6):1220-1234.
- Hall, R., 2002. Cenozoic geological and plate tectonic evolution of SE Asia and the SW Pacific: computer-based reconstructions, model and animations. *J. Asian Earth Sci.* 20:353-431.
- Hoser, R. T. 1996. *Smuggled-2: wildlife Trafficking, Crime and Corruption in Australia*. Kotabi P/L., Doncaster, Victoria, 3108, Australia:260 pp.
- Hoser, R. T. 1998. Death Adders (Genus *Acanthophis*): An overview, including descriptions of Five new species and One subspecies. *Monitor - Journal of the Victorian Herpetological Society* 9(2):20-41.
- Hoser, R. T. 2012. *Yeomansus*: A New Genus for the Slender Racer (Serpentes:Colubridae). *Australasian Journal of Herpetology* 14:3-5.
- Iskandar, D. T. and Erdelen, W. R. 2006. Conservation of amphibians and reptiles in Indonesia: issues and problems. *Amphibian and Reptile Conservation* 4(1):60-87.
- Keogh, S. J., Scott, A. W., Fitzgerald, M. and Shine, R. 2003. Molecular phylogeny of the Australian venomous snake genus *Hoplocephalus* (Serpentes, Elapidae) and conservation genetics of the threatened *H. stephensii*. *Conservation Genetics* 4:57-65.
- Kinghorn, J. R. 1928. Herpetology of the Solomon Islands. *Rec. Austral. Mus.* 16:123-178.
- Kinghorn, J. R. 1937. A new species of skink from the Solomon Islands. *Records of the Australian Museum* 20(1):1-2.
- McCoy, M. 1980. *Reptiles of the Solomon Islands*. Wau Ecology Institute Handbook 7. Wau Ecology Institute, Wau, Papua New Guinea.
- McCoy, M. 2006. *Reptiles of the Solomon Islands*. Pensoft Series Faunistica 57:212 pp.
- McDowell, S. B. 1970. On the status and relationships of the Solomon Island elapid snakes. *Journal of Zoology*, London 161:145-190.
- Mys, B. 1988. The zoogeography of the scincid lizards from North Papua New Guinea (Reptilia: Scincidae). I. The distribution of the species. *Bull. Inst. Roy. Sci. Nat. Belgique (Biologie)* 58:127-183.
- Ogilby, J. D. 1890. Report on a zoological collection from the Solomon Islands. Part 2. *Rec. Austr. Mus.* 1:5-7.
- Pianka, E. R. and Vitt, L. J. 2003. *Lizards - Windows to the Evolution of Diversity*. University of California Press, Berkeley:347 pp.
- Pyron, R. A., Burbrink, F. T. and Wiens, J. J. 2013. A phylogeny and revised classification of Squamata, including 4161 species of lizards and snakes. *BMC Evolutionary Biology* 13:93.
- Reeder, T. W. 2003. A phylogeny of the Australian *Sphenomorphus* group (Scincidae: Squamata) and the phylogenetic placement of the crocodile skinks (*Tribolonotus*): Bayesian approaches to assessing congruence and obtaining confidence in maximum likelihood inferred relationships. *Molecular Phylogenetics and Evolution* 27:384-397.
- Ride, W. D. L. (ed.) et al. (on behalf of the International Commission on Zoological Nomenclature) 1999. *International code of Zoological Nomenclature* (Fourth edition). The Natural History Museum - Cromwell Road, London SW7 5BD, UK (also commonly cited as "The Rules", "Zoological Rules" or "ICZN 1999").
- Rittmeyer, E. N. and Austin, C. C. 2015. Combined next-generation sequencing and morphology reveal fine-scale speciation in Crocodile Skinks (Squamata: Scincidae: *Tribolonotus*). *Mol Ecol.* 2015 Jan, 24(2):466-83. doi: 10.1111/mec.13030. Epub 2015 Jan 9.
- Russell, E. and Coupe, S. 1984. *The Macquarie World Illustrated Atlas*. Kevin Weldon, Macquarie Library, Chatswood, NSW, Australia:511 pp.
- Schmidt, K. P. 1932. Reptiles and Amphibians from the Solomon Islands. *Field Mus. Nat. Hist. Zool. Ser.* 18(9):175-190.
- Victorian Civil and Administrative Tribunal (VCAT). 2015. *Hoser v Department of Environment Land Water and Planning* (Review and Regulation) [2015] VCAT 1147 (30 July 2015).
- Williams, E. E. and Parker, F. 1964. The snake, genus *Parapistocalamus* on Bougainville, Solomon Islands. *Senckenberg. biol.* 45:543-552.
- Zweifel, R. G. 1966. A New Lizard of the Genus *Tribolonotus* (Scincidae) from New Britain. *American Museum Novitates* 2264:1-12.

#### CONFLICT OF INTEREST

The author has no known conflicts of interest in terms of this paper and conclusions within.

#### Australasian Journal of Herpetology®

ISSN 1836-5698 (Print)

ISSN 1836-5779 (Online)

Publishes original research in printed form in relation to reptiles, other fauna and related matters, including the subjects of classification, ecology, public interest, legal, captivity, exposure of frauds, "academic misconduct", etc.

It is a peer reviewed printed journal published in hard copy for permanent public scientific record, with a sizeable print run and has a global audience.

Full details at:

<http://www.herp.net>

**A review of the Xenodermidae and the Dragon Snake *Xenodermus javanicus* Reinhardt, 1836 species group, including the formal description of three new species, a division of *Achalinus* Peters, 1869 into two genera and *Stoliczka* Jerdon, 1870 into subgenera (Squamata; Serpentes, Alethinophidia, Xenodermidae).**

**RAYMOND T. HOSER**

**488 Park Road, Park Orchards, Victoria, 3134, Australia.**

**Phone: +61 3 9812 3322 Fax: 9812 3355 E-mail: snakeman (at) snakeman.com.au**  
**Received 3 September 2015, Accepted 8 September 2015, Published 1 August 2016.**

---

**ABSTRACT**

Snakes in the genera *Xenodermis* Reinhardt, 1836 and *Achalinus* Peters, 1836 were reviewed. Regional variants of the putative species *X. javanicus* Reinhardt, 1836 were found to be sufficiently divergent to warrant being treated as full species. Other genera within the Xenodermidae were also reviewed. The species currently known as *Achalinus meiguensis* Hu and Zhao, 1966 was found to be sufficiently divergent both morphologically and by molecular analysis from other *Achalinus* Peters, 1869 species to warrant being placed in a separate genus. *Stoliczka* Jerdon, 1870 currently contains two species that are divergent geographically and to a lesser extent morphologically and well separated by habitat. Therefore one is transferred to a new subgenus. As a result this paper formally names three new species of *Xenodermus*, namely *X. oxyi* sp. nov., *X. crottyi* sp. nov. and *X. sloppi* sp. nov., a new monotypic genus *Fereachalinus* gen. nov. and a new subgenus within *Stoliczka*, namely *Parastoliczka* subgen. nov..

**Keywords:** Taxonomy; snakes; nomenclature; Asia; *Xenodermus*; *Achalinus*; species; *javanicus*; *meiguensis*; new species; *oxyi*; *crottyi*; *sloppi*; new genus; *Fereachalinus*; new subgenus; *Parastoliczka*.

---

**INTRODUCTION**

In recent years, significant numbers of the distinctive Asian Dragon Snake *Xenodermus javanicus* Reinhardt, 1836, have made their way into the private pet trade in Europe and the United States. The nominate form is allegedly common in parts of Java. The putative species is also known from elsewhere in south-east Asia, including Peninsula Malaysia, Thailand, Sumatra and Borneo.

While this appears to be a widespread distribution, a close inspection of known specimens found that the taxon as currently recognized is largely confined to small areas of hilly forested habitat at higher elevations or immediately adjacent sites. By way of example, no specimens are known from flatter areas in Borneo, including the far south, or anywhere in Sumatra except for the far north-west which is relatively hilly.

Specimens from Thailand, possibly Burma and Peninsula Malaysia are only known from the border areas of the Isthmus of Kra in the regions where the three countries (more-or-less) abut.

Specimens from all known collection locations were inspected and found to be morphologically divergent in characteristics that indicated long-term divergence of populations, notwithstanding the evolutionarily conservative nature of the snakes.

In spite of land bridges between the relevant parts of South-east Asia during ice-age minima, it is unlikely any gene flow would have occurred between populations in the recent past on the basis of generally unsuitable habitat in the intervening spaces.

Even now, the putative species *Xenodermus javanicus* remains absent on low-lying islands between the higher land masses that

these snakes are found, indicating recent gene flow between the populations is not likely to have happened.

Based on both the genetic isolation of the known populations and the morphological divergences of each, it is appropriate that they be recognized as distinct species.

As there are no names available for the Peninsula Malaysia/Thailand population, that from northern Borneo or that from north-west Sumatra, each are named according to the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

I note herein that the names *Gonionotus plumbeus* Gray, 1846 and *Xenoderma gonyonotus* Lichtenstein and Martens, 1856 are unavailable for the two unnamed populations as both apply to snakes from Java (Boulenger, 1893).

At the same time this review took place, other taxa within the Xenodermidae were inspected and reviewed in order to check that all were appropriately placed at the genus level and/or if there were any obviously unrecognized taxa within any genus.

At the first level, it became clear that one species within the genus *Achalinus* Peters, 1869 was significantly divergent from the others in the genus in terms of morphology and genetically.

This was the taxon formally described as *Achalinus meiguensis* Hu and Zhao, 1966 which has noticeably larger body scales (evidenced by a lower mid body scale rows count), as well as significantly different head scalation to all the other species.

Set apart morphologically, this taxon was also shown to be significantly divergent in the molecular results of Pyron *et al.*

(2013) and so I have no hesitation in erecting a new genus for this taxon. It is called *Fereachalinus gen. nov.*

The genus *Stoliczka* Jerdon, 1870 currently contains two species that are divergent geographically and to a lesser extent morphologically and well separated by habitat. Therefore one is transferred to a new subgenus named *Parastoliczka subgen. nov.*

I note further that the two relevant species are confined to highland areas and so have no obvious bridge between populations.

Publications relevant to the snakes currently referred to as *Xenodermus javanicus* Reinhardt, 1836 *sensu lato*, including the taxonomic judgements made herein include the following: Boulenger (1893), Brongersma (1929), Chan-ard *et al.* (2015), Das (2012), David and Vogel (1996), de Rooij (1917), Flower (1896), Gower *et al.* (2012), Grandison (1978), Gray (1849), Haas (1950), Jan (1863), Kopstein (1938a, 1938b), Kudryavtsev and Latyshev (2015), Lampe (1902), Lönnberg and Rendahl (1925), Manthey and Grossmann (1997), Müller (1887, 1890), Reinhardt (1836), Robinson and Kloss (1920), Rovatsos *et al.* (2015), Savage (2015), Smith (1930, 1943), Stuebing and Inger (1999), Taylor (1965), Teynié *et al.* (2010), Tweedie (1983), Volz (1904), Welch (1988), Werner (1900, 1922) and sources cited therein.

Key publications relevant to the snakes in the genus *Achalinus* Peters, 1869 as defined to date include the following: Barbour (1917), Boulenger (1893, 1888, 1908), Bourret (1937), Chen (2009), Fang and Wang (1983), Gao (1991), Goris and Maeda (2004), Günther (1889), Guo *et al.* (1999), Hecht *et al.* (2013), Hu and Zhao (1966), Hu *et al.* (1975), Inger *et al.* (1990), Kou and Wang (2003), Maki (1931), Mell (1931), Moriguchi and Naito (1979), Orlov, *et al.* (2000), Ota (2000), Ota and Toyama (1989a, 1989b), Ota *et al.* (1991), Peters (1869), Pyron *et al.* (2013), Sang *et al.* (2009), Shie (2005), Smith (1943), Steindachner (1913), Stejneger (1907, 1910), Toriba (1993), Van Denburgh (1912), Ziegler (2002), Zong and Ma (1983) and sources cited therein.

Key publications relevant to the snakes in the genus *Stoliczka* Jerdon, 1870 as defined to date include the following: Boulenger (1893, 1899), Das (1997, 2006, 2012), de Rooij (1917), Jerdon (1870), Malkmus *et al.* (2002), Manthey (1983), Manthey and Grossmann (1997), Sharma (2004), Smith (1943) and sources cited therein.

The materials and methods used as the basis for the following taxonomic results included a review of all available literature (as cited above) and specimens of all relevant taxa from all or most of where they are known to occur, when good locality information was available for specimens.

I also note that, notwithstanding the theft of relevant materials from this author in an illegal armed raid on 17 August 2011, which were not returned in breach of undertakings to the court (Court of Appeal Victoria 2014 and VCAT 2015), I have made a decision to publish this paper in view of the conservation significance attached to the formal recognition of unnamed taxa and on the basis that further delays may in fact put these unnamed taxa at greater risk of extinction, noting the extensive increase in human population in the area and associated habitat destruction occurring.

#### **XENODERMUS OXYI SP. NOV.**

**Holotype:** A preserved specimen at the Field Museum of Natural History, Chicago, Illinois, USA, specimen number: FMNH 246192, collected from the Lahad Datu District in Sabah, Borneo, Malaysia.

This facility allows access of its holdings to scientists.

**Paratypes:** 1/ A preserved specimen at the Field Museum of Natural History, Chicago, Illinois, USA, specimen number: FMNH158613, collected from the Bintulu District, Sarawak, Borneo, Malaysia.

2/ A preserved specimen at the Field Museum of Natural History,

Chicago, Illinois, USA, specimen number: FMNH248958, collected from the Tawau District, Sabah, Borneo, Malaysia.

**Diagnosis:** *Xenodermus oxyi sp. nov.* is readily separated from the other three species of *Xenodermus* by the presence of light tubercles on the labial line. It is further distinguished from the other species by the presence of a large number of red specks on the upper surface of the head and forebody. When specimens of *Xenodermus* from Java, Sumatra or the Isthmus of Kra have red or orange specks, they are very few.

*Xenodermus crottyi sp. nov.* is readily separated from the other three species of *Xenodermus* by the presence of a distinct reddish tinge dorsally.

It is further separated from the other species by the ventral colouration. In life, the individual scales are mainly black (in the centre), with thick white edges. In the other species, except for *X. sloppi sp. nov.* this edging is bluish-black tinged.

*X. sloppi sp. nov.* is separated from the other three species in the genus by colouration. In this species the dorsal surface has a dark brownish tinge (as opposed to being overwhelmingly bluish-grey in the others, excluding *X. crottyi sp. nov.* which is bluish-grey above, but with a noticeable reddish tinge that separates it from the rest).

Ventrally, *X. sloppi sp. nov.* differs from the other species with each subcaudal being dark brown in colouration, with thick off-white edges forming a well-defined boundary for each scale.

*X. sloppi sp. nov.* has 174 ventrals (similar to the other species), 128 subcaudals (versus 147 in *X. javanicus*) and 48 midbody rows, (versus 40 in *X. javanicus*, 48 in *X. crottyi sp. nov.* and 44 in *X. sloppi sp. nov.*).

*X. javanicus* is readily separated from the other species of *Xenodermus* by having (in life) a pinkish-white tongue, versus a bluish-white tongue in the other three species. *X. javanicus* is further separated by the very prominent blunt edged spines that form the longitudinal rows running down the length of the body, which are noticeably darker (as in black) than the bluish-grey background colour of the upper body. While these raised spines are also present in the other species, the individual spines are proportionately smaller and slightly more angular in appearance and only slightly darker in colour than the nearby greyish scales.

*X. javanicus* is also characterised by an average of 40 dorsal mid body rows, versus 44 or more in the other three species.

The four species in the genus *Xenodermus*, namely *X. oxyi sp. nov.*, *X. crottyi sp. nov.*, *X. sloppi sp. nov.* and *X. javanicus* Reinhardt, 1836, and the genus itself are all defined and separated from all other snakes by the following unique suite of characters:

Teeth subequal, about 15 in each maxillary. Head distinct from neck, covered with granular juxtaposed scales; nostrils directed forwards, in an undivided nasal; eye moderate, with a round pupil. Body slender, compressed, with small juxtaposed keeled scales and longitudinal rows of large tubercles; ventrals well developed. Tail long, with single subcaudals. Rostral small, triangular, not visible from above; nasals meeting behind the point of the rostral, followed by two pairs of small shields; labials scarcely enlarged, about 20 on each side; no chinshields. About 40-48 scales across the body (mid body rows); the tubercles disposed in pairs alternating with single ones on the vertebral line, and forming a single series along each side of the back. 173-185 ventrals; anal entire; 128-147 subcaudals. Colour is a dark greyish brown above and without markings, blotches or stripes. The venter is light in colour, with or without darker markings in the center of each scale (adapted from Boulenger, 1893).

**Distribution:** *Xenodermus oxyi sp. nov.* is confined to the northern two-thirds of Borneo, either in, or directly adjacent to the northern and central mountain ranges.

**Etymology:** Named in honour of my now deceased family pet Great Dane named *Oxyuranus* (or "Oxy" for short), who spent

some 8 years protecting the Hoser family children from thieves and thugs and also played a valuable role in teaching people to be nice to animals via the Snakebusters educational wildlife shows.

I have no hesitation in naming a species in honour of a non-human inhabitant of this planet who has made a worthwhile contribution to humanity and the welfare of other animals.

By the way *Oxyuranus* Kinghorn, 1923 is the scientific name for a genus of Australasian elapid snake.

**XENODERMUS CROTTYI SP. NOV.**

**Holotype:** A preserved specimen at the Field Museum of Natural History, Chicago, Illinois, USA, specimen number: FMNH178442, collected from Yala, southern Thailand.

This facility allows access of its holdings to scientists.

**Paratype:** A specimen at the Museum of Natural History, UK, specimen number: 1939.1.4.5 (also stored as: NHMUK:catalogue:1890625) from Victoria Point (now known as Kawthang), Thailand.

**Diagnosis:** *Xenodermus crottyi* sp. nov. is readily separated from the other three species of *Xenodermus* by the presence of a distinct reddish tinge dorsally.

It is further separated from the other species by the ventral colouration. In life, the individual scales are mainly black (in the centre), with thick white edges. In the other species, except for *X. sloppi* sp. nov. this edging is bluish-black tinged.

*Xenodermus oxyi* sp. nov. is readily separated from the other three species of *Xenodermus* by the presence of light tubercles on labial line. It is further distinguished from the other species by the presence of a large number of red specks on the upper surface head and forebody. When specimens of *Xenodermus* from Java, Sumatra or the Isthmus of Kra have red or orange specks, they are very few.

*X. sloppi* sp. nov. is separated from the other three species in the genus by colouration. In this species the dorsal surface has a dark brownish tinge (as opposed to being overwhelmingly bluish-grey in the others, excluding *X. crottyi* sp. nov. which is bluish-grey above, but with a noticeable reddish tinge that separates it from the rest).

Ventrally, *X. sloppi* sp. nov. differs from the other species with each subcaudal being dark brown in colouration, with thick off-white edges forming a well-defined boundary for each scale.

*X. sloppi* sp. nov. has 174 ventrals (similar to the other species), 128 subcaudals (versus 147 in *X. javanicus*) and 48 midbody rows, (versus 40 in *X. javanicus*, 48 in *X. crottyi* sp. nov. and 44 in *X. sloppi* sp. nov.).

*X. javanicus* is readily separated from the other species of *Xenodermus* by having (in life) a pinkish-white tongue, versus a bluish-white tongue in the other three species. *X. javanicus* is further separated by the very prominent blunt edged spines that form the longitudinal rows running down the length of the body, which are noticeably darker (as in black) than the bluish-grey background colour of the upper body. While these raised spines are also present in the other species, the individual spines are proportionately smaller and slightly more angular in appearance and only slightly darker in colour than the nearby greyish scales.

*X. javanicus* is also characterised by an average of 40 dorsal mid body rows, versus 44 or more in the other three species.

The four species in the genus *Xenodermus*, namely *X. oxyi* sp. nov., *X. crottyi* sp. nov., *X. sloppi* sp. nov. and *X. javanicus* Reinhardt, 1836, and the genus itself are all defined and separated from all other snakes by the following unique suite of characters:

Teeth subequal, about 15 in each maxillary. Head distinct from neck, covered with granular juxtaposed scales; nostrils directed forwards, in an undivided nasal; eye moderate, with round pupil. Body slender, compressed, with small juxtaposed keeled scales and longitudinal rows of large tubercles; ventrals well developed. Tail long, with single subcaudals. Rostral small, triangular, not

visible from above; nasals meeting behind the point of the rostral, followed by two pairs of small shields; labials scarcely enlarged, about 20 on each side; no chinshields. About 40-48 scales across the body (mid body rows); the tubercles disposed in pairs alternating with single ones on the vertebral line, and forming a single series along each side of the back. 173-185 ventrals; anal entire; 128-147 subcaudals. Colour is a dark greyish brown above and without markings, blotches or stripes. The venter is light in colour, with or without darker markings in the center of each scale, or as described for each species above (adapted from Boulenger, 1893).

**Distribution:** *Xenodermus oxyi* sp. nov. is confined to the northern two-thirds of Borneo, either in, or directly adjacent to the northern and central mountain ranges.

**Etymology:** Named in honour of my now deceased family pet Great Dane/Rottweiler Cross named *Crotalus* (or "Crotty" for short), who spent some 13 years protecting the Hoser family and research facility from thieves and thugs and also played a valuable role in teaching people to be nice to animals via the educational displays we did at the time.

I have no hesitation in naming a species in honour of a non-human inhabitant of this planet who has made a worthwhile contribution to humanity and the welfare of other animals.

By the way *Crotalus* Linnaeus, 1758 is the scientific name for a genus of mainly North American Pitvipers.

**XENODERMUS SLOPPI SP. NOV.**

**Holotype:** A preserved specimen at the Museum Wiesbaden, Wiesbaden, Germany, specimen number: 1119 collected at Peiagak, Süd-Atjeh, Sumatra, Indonesia, in 1902 by Dr. A. Fuchs of Bornich, Germany.

A detailed description of this specimen is in Lampe (1902). The Museum Wiesbaden allows access to its holdings.

**Diagnosis:** *Xenodermus sloppi* sp. nov. is separated from the other three species in the genus by colouration. In this species the dorsal surface has a dark brownish tinge (as opposed to being overwhelmingly bluish-grey in the others, excluding *X. crottyi* sp. nov. which is bluish-grey above, but with a noticeable reddish tinge that separates it from the rest).

Ventrally, *X. sloppi* sp. nov. differs from the other species with each subcaudal being dark brown in colouration, with thick off-white edges forming a well-defined boundary for each scale.

*X. sloppi* sp. nov. has 174 ventrals (similar to the other species), 128 subcaudals (versus 147 in *X. javanicus*) and 48 midbody rows, (versus 40 in *X. javanicus*, 48 in *X. crottyi* sp. nov. and 44 in *X. sloppi* sp. nov.).

*Xenodermus oxyi* sp. nov. is readily separated from the other three species of *Xenodermus* by the presence of light tubercles on the labial line. It is further distinguished from the other species by the presence of a large number of red specks on the upper surface head and forebody. When specimens of *Xenodermus* from Java, Sumatra or the Isthmus of Kra have red or orange specks, they are very few.

*Xenodermus crottyi* sp. nov. is readily separated from the other three species of *Xenodermus* by the presence of a distinct reddish tinge dorsally.

It is further separated from the other species by the ventral colouration. In life, the individual scales are mainly black (in the centre), with thick white edges. In the other species, except for *X. sloppi* sp. nov. this edging is bluish-black tinged.

*X. javanicus* is readily separated from the other species of *Xenodermus* by having (in life) a pinkish-white tongue, versus a bluish-white tongue in the other three species. *X. javanicus* is further separated by the very prominent blunt edged spines that form the longitudinal rows running down the length of the body, which are noticeably darker (as in black) than the bluish-grey background colour of the upper body. While these raised spines are also present in the other species, the individual spines are proportionately smaller and slightly more angular in appearance

and only slightly darker in colour than the nearby greyish scales. *X. javanicus* is also characterised by an average of 40 dorsal mid body rows, versus 44 or more in the other three species. The four species in the genus *Xenodermus*, namely *X. oxyi* sp. nov., *X. crottyi* sp. nov., *X. sloppi* sp. nov. and *X. javanicus* Reinhardt, 1836, and the genus itself are all defined and separated from all other snakes by the following unique suite of characters:

Teeth subequal, about 15 in each maxillary. Head distinct from the neck, covered with granular juxtaposed scales; nostrils directed forwards, in an undivided nasal; eye moderate, with round pupil. Body slender, compressed, with small juxtaposed keeled scales and longitudinal rows of large tubercles; ventrals well developed. Tail is long, with single subcaudals. Rostral small, triangular, not visible from above; nasals meeting behind the point of the rostral, followed by two pairs of small shields; labials scarcely enlarged, about 20 on each side; no chinshields. About 40-48 scales across the body (mid body rows); the tubercles disposed in pairs alternating with single ones on the vertebral line, and forming a single series along each side of the back. 173-185 ventrals; anal entire; 128-147 subcaudals. Colour is a dark greyish brown above and without markings, blotches or stripes. The venter is light in colour, with or without darker markings in the center of each scale or as described for each species above (adapted from Boulenger, 1893).

**Distribution:** Known only from north-west Sumatra, in the vicinity of the locations of Perlak (AKA Peureulak) and Sibolangit, north-west Sumatra, Indonesia.

**Etymology:** Named in honour of the family pet Great Dane named *Slopp*, who has spent some years protecting the Hoser family and research facility from thieves and thugs and also played a valuable role in teaching people to be nice to animals via the the educational displays we do via Snakebusters: Australia's best reptiles, being the only hands on reptile shows in Australia.

I have no hesitation in naming a species in honour of a non-human inhabitant of this planet who has made a worthwhile contribution to humanity and the welfare of other animals.

#### **FEREACHALINUS GEN. NOV.**

**Type species:** *Achalinus meiguensis* Hu and Zhao, 1966.

**Diagnosis:** *Fereachalinus* gen. nov. is readily separated from *Achalinus* Peters, 1869 by the following unique suite of characters: The internasal is fused to the prefrontal (as opposed to being separated from the prefrontal by a suture in all species of *Achalinus*), the mental is in contact with the anterior postmental (versus being separated from the anterior postmental by the second infralabial in all species of *Achalinus*), 19 midbody scale rows (versus 21 or more in all species of *Achalinus*).

The divergent species *Achalinus formosanus* Boulenger, 1908 with 25 or 27 midbody rows has been placed in the genus *Achalinopsis* Steindachner, 1913, which has been accepted by some authors (e.g. Zong and Ma, 1983), but not others (e.g. Shie, 2005).

In any event, this taxon is not as divergent from the nominate species for *Achalinus*, namely *Achalinus spinalis* Peters, 1869 (23 midbody rows) as "*Achalinus meiguensis* Hu and Zhao, 1966".

Both the genera *Fereachalinus* gen. nov. and *Achalinus* are separated from all other snakes by the following unique suite of characters: Maxillary teeth 22 to 25, small equal; mandibular teeth equal. Head not distinct from the neck; eye small, with round or vertically sub-elliptic pupil; nostril rather large, pierced or not pierced in the anterior of two nasals; posterior nasal concave; no praeocular, loreal extending from the nasals to the eye; postoculars not distinct from anterior temporals. Body cylindrical, slender; scales lanceolate, feebly imbricate, keeled, without apical pits, in 19-27 midbody rows; ventrals rounded. Tail

long, subcaudals single. Hypapophyses developed throughout the vertebral column.

**Distribution:** Restricted to West Sichuan and Yunnan, China at an elevation of 1200-1400 m.

**Etymology:** Named in reflection of the fact that the relevant taxon is nearly, but not quite "*Achalinus*".

**Content:** *Fereachalinus meiguensis* (Hu and Zhao, 1966) (monotypic).

#### **PARASTOLICZKIA SUBGEN. NOV.**

**Type species:** *Stoliczka borneensis* Boulenger, 1899.

**Diagnosis:** *Parastoliczka* subgen. nov. from the island of Borneo is physically similar to *Stoliczka* Jerdon, 1870 from the Khazi Hills in north-east India.

However, *Parastoliczka* subgen. nov. differs from *Stoliczka* by having a large triangular rostral (versus tiny in *Stoliczka*), ten supralabials (as opposed to eight in *Stoliczka*), a large loreal that is much longer than deeo (versus a tiny loreal in *Stoliczka*), roughly 124 subcaudals in females (versus 115 in *Stoliczka*); colouration that is generally rufous, with large blackish spots, at least as large as the space between them, disposed more or less regularly in three longitudinal series, with a brownish venter, with each scale etched with yellowish (versus purplish brown above; three or four outer rows of scales and the ventrals are white with brown edges, in *Stoliczka*).

Both *Parastoliczka* subgen. nov. and *Stoliczka* are separated from all other snakes by the following unique suite of characters: Teeth small, subequal, about 14 in each maxillary. Head distinct from neck, covered with large shields; nostrils directed forwards; nasal shield undivided; eye small, with round pupil. A pair of very narrow internasals; a pair of large praefrontals, separated from the frontal and supraoculars by a series of small scales; frontal a little broader than long, a little shorter than the parietals; supraocular very small; narrow parietals nearly twice as long as the frontal; a large praeocular and two postoculars; eye very prominent, with vertically subelliptic pupil, nostril very large temporals small, scale-like; a single pair of small chin-shields, in contact with three lower labials. Scales in 30 rows, dorsals separated by naked skin, laterals larger and juxtaposed. Ventrals about 210 in females; anal single. Body slender, compressed; scales elliptical, juxtaposed, strongly keeled, increasing in size towards the ventrals, which are well developed. Tail long; subcaudals single.

**Distribution:** Known only from hillier parts of the northern half of the island of Borneo, mainly, but not exclusively on the Malaysian side.

**Etymology:** Named *Parastoliczka* as it isn't exactly *Stoliczka* Jerdon, 1870.

**Content:** *Stoliczka* (*Parastoliczka*) *borneensis* Boulenger, 1899 (monotypic).

#### **NOTES ON THE DESCRIPTIONS FOR ANY POTENTIAL REVISORS**

Unless mandated by the rules of the *International Code of Zoological Nomenclature*, none of the spellings of the newly proposed names should be altered in any way. Should one or more newly named taxa be merged by later authors to be treated as a single species, the order of priority of retention of names should be the order (page priority) of the formal descriptions within this text.

#### **REFERENCES CITED**

- Barbour, T. 1917. A most regrettable tangle of names. *Occasional Papers of the Museum of Zoology*, University of Michigan (44):1-9.
- Boulenger, G. A. 1893. *Catalogue of the snakes in the British Museum (Nat. Hist.) I*. London (Taylor and Francis):448 pp.
- Boulenger, G. A. 1888. Description of two new snakes from Hongkong, and note on the dentition of *Hydrophis viperina*. *Ann. Mag. nat. Hist.* (6)2:43-44.



- Boulenger, G. A. 1899. Description of three new reptiles and a new batrachian from Mt. Kina Balu, North Borneo. *Ann. Mag. Nat. Hist.* (7)4:451-453.
- Boulenger, G. A. 1908. Description of a new frog and a new snake from Formosa. *Ann. Mag. Nat. Hist.* (8)2:221-222.
- Bourret, R. 1937. Notes herpétologiques sur l'Indochine française. XV. Lézards et serpents reçus au laboratoire des Sciences Naturelles de l'Université au cours de l'année 1937. Descriptions de deux espèces et de deux variétés nouvelles. *Bulletin Générale de l'Instruction Publique* 5. Gouvernement Général de l'Indochine:57-82.
- Brongersma, L. D. 1929. Appendix III. A list of the reptiles from Java. After "N. DE ROOJ, Indo-Australian Reptiles, I and II 1915-'17", In: Dammerman, K. W. (ed.), On the zoogeography of Java, *Treubia*, 11:64-68.
- Chan-ard, T., Parr, J. W. K. and Nabhitabhata, J. 2015. *A field guide to the reptiles of Thailand*. Oxford University Press, NY:352 pp.
- Chen, Y. 2009. Conservation biogeography of the snake family Colubridae of China. *North-Western Journal of Zoology* 5(2):251-262.
- Court of Appeal Victoria. 2014. Hoser v Department of Sustainability and Environment [2014] VSCA 206 (5 September 2014).
- Das, I. 1997. Checklist of the reptiles of India with English common names. *Hamadryad* 22(1):32-45.
- Das, I. 2006. Crocker Range National Park, Sabah, as a refuge for Borneo's montane herpetofauna. *Amphibian and Reptile Conservation* 4(1):3-11.
- Das, I. 2012. *A Naturalist's Guide to the Snakes of South-East Asia: Malaysia, Singapore, Thailand, Myanmar, Borneo, Sumatra, Java and Bali*. John Beaufoy Publishing, Oxford, UK.
- David, P. and Vogel, G. 1996. *The snakes of Sumatra. An annotated checklist and key with natural history notes*. Bücher Kreth, Frankfurt/M.
- de Rooij, N. 1917. *The Reptiles of the Indo-Australian Archipelago. II. Ophidia*. Leiden (E. J. Brill), xiv+334 S.
- Fang, R. and Wang, T. 1983. Three new records of snakes from Shaanxi. *Acta Herpetologica Sinica* 2(2): 75-76.
- Flower, S. S. 1896. Notes on a collection of reptiles and batrachians made in the Malay Peninsula in 1895-96; with a list of species recorded from that region. *Proc. Zool. Soc. London*, 1896:856-914, pl. 44-46.
- Gao, Z. 1991. Discovery of *Achalinus meiguensis* in Anxian County, Sichuan. *Sichuan Journal of Zoology* 10(1):33.
- Goris, R. C. and Maeda, N. 2004. *Guide to the Amphibians and Reptiles of Japan*. Krieger, Malabar:285 pp.
- Gower, D., Garrett, K. and Stafford, P. 2012. *Snakes*. Firefly Books, Buffalo, NY:144 pp.
- Grandison, A. G. C. 1978. Snakes of West Malaysia and Singapore. *Annalen des Naturhistorischen Museums in Wien* 81 [1977]:283-303.
- Gray, J. E. 1849. *Catalogue of the specimens of snakes in the collection of the British Museum*. British Museum (Natural History), London, UK:i-xv+1-125.
- Günther, A. 1889. Third contribution to our knowledge of reptiles and fishes from the Upper Yangtze-Kiang. *Ann. Mag. Nat. Hist.* (6)4(21):218-229.
- Guo, P., Zhang, F. J. and Chen, Y. Y. 1999. Catalogue of type specimens of reptiles in the Herpetological Collections of Chengdu Institute of Biology, the Chinese Academy of Sciences. *Asiatic Herpetological Research* 8:43-47.
- Haas, C. P. J. De, 1950. Checklist of the snakes of the Indo-Australian Archipelago (Reptilia, Ophidia). *Treubia*, 20:511-625.
- Hecht, V. L., Pham, C. T., Nguyen, T. T., Nguyen, T. Q., Bonkowski, M. and Ziegler, T. 2013. First report on the herpetofauna of Tay Yen Tu Nature Reserve, northeastern Vietnam. *Biodiversity Journal* 4(4):507-552.
- Hu, S. -Q. and Zhao, E. -M. 1966. Three new Species of Reptiles from Szechwan. *Acta Zootaxon. Sinica* 3:162.
- Hu, S., Zhao, E. -M and Huang, Z. 1975. Three new species of reptiles from Hainan Island, Guangdong Province (in Chinese with English abstract). *Acta Zool. Sinica*, Peking, 21(4): 379-384 (English translation by Akihiro Koshikawa 1982, Smithsonian Herp. Inf. Serv, Washington, 53:1-9).
- Inger, R. F., Zhao, E., Bradley Shaffer, H. and Wu, G. 1990. Report on a collection of amphibians and reptiles from Sichuan, China. *Fieldiana: Zoology* (58):i-iii+1-24.
- Jan, G. 1863. *Elenco systematico degli ofidi descritti e disegnati per l'iconografia generale*. Milano A. Lombardi:i-vii+1-143.
- Jerdon, T. C. 1870. Notes on Indian Herpetology. *Proc. Asiat. Soc. Bengal* March 1870:66-85.
- Kopstein, F. 1938a. Ein Beitrag zur Eierkunde und zur Fortpflanzung der Malaiischen Reptilien. *Bull. Raffl. Mus.* 14:81-167.
- Kopstein, F. 1938b. Ein Beitrag zur Morphologie, Biologie und Ökologie von *Xenodermus javanicus* Reinhardt. *Bull. Raffl. Mus.* 14:168-174.
- Kou, Z. and Wang, X. 2003. A new record of snake, *Achalinus meiguensis* in Yunnan Province. *Sichuan Journal of Zoology* 22(4):263-267.
- Kudryavtsev, S. V. and Latyshev, V. A. 2015. *Xenodermus javanicus* Reinhardt, 1836: Captive Husbandry and Breeding. *Russian Journal of Herpetology* 22(1):75-78.
- Lampe, E. 1902. Catalog der Reptilien- und Amphibien-Sammlung (Schlangen; Froch-, Schwanz- und Schleichenlurche) des Naturhistorischen Museums zu Wiesbaden. *Jahrb. Nass. Ver. F. Naturk. Wiesbaden* 55:1-66.
- Lönnberg, E. and Rendahl, H. 1925. Dr. E. Mjöberg's zoological collections from Sumatra (Reptiles and Batrachians). *Ark. Zool. Stockholm*, (A), 17(23):1-3.
- Maki, M. 1931. *Monograph of the Snakes of Japan*. Dai-ichi Shobo, Tokyo. (1)7:240 pp.
- Malkmus, R., Manthey, U., Vogel, G., Hoffmann, P. and Kosuch, J. 2002. *Amphibians and reptiles of Mount Kinabalu (North Borneo)*. A.R.G. Gantner Verlag, Rugell:404 pp.
- Manthey, U. 1983. Exkursion am Mt. Kinabalu (4101 m), Nordborneo, Teil 3: Checkliste der Herpetofauna oberhalb 600 m ü. NN. *Herpetofauna* (Münster) 5(23):20-31.
- Manthey, U. and Grossmann, W. 1997. *Amphibien und Reptilien Südostasiens*. Natur und Tier Verlag (Münster):512 pp.
- Mell, R. 1931. List of Chinese snakes. *Lingnan Sci. Jour., Canton*, 8[1929]:199-219.
- Moriguchi, H. and Naito, S. 1979. A new locality record of *Achalinus spinalis wernerii* from Tokuno-shima. *Japanese Journal of Herpetology* 8(1):36.
- Müller, F. 1887. Fünfter Nachtrag zum Katalog der herpetologischen Sammlung des Basler Museums. *Verh. Naturforsch. Ges. Basel*, 8(2):249-296, pl. 1-3.
- Müller, F. 1890. Sechster Nachtrag zum Katalog der herpetologischen Sammlung des Basler Museums. *Verh. Naturforsch. Ges. Basel*, 8(3)[1889]:685-705, pl.10.
- Orlov, N. L., Murphy, R. W. and Papenfuss, T. J. 2000. List of snakes of Tam-Dao mountain ridge (Tonkin, Vietnam). *Russ. J. Herpetol.* 7(1):69-80.
- Ota, H. 2000. Current status of the threatened amphibians and reptiles of Japan. *Popul. Ecol.* 42 5-9.
- Ota, H. and Toyama, M. 1989a. Two additional specimens of *Achalinus formosanus chigirai* (Colubridae: Ophidia) from the Yaeyama Group, Ryukyu Archipelago. *Japanese Journal of Herpetology* 13(2):40-43.
- Ota, H. and Toyama, M. 1989b. Taxonomic Re-Definition of

- Achalinus formosanus* Boulenger (Xenodermiinae: Colubridae: Ophidia), with Description of a New Subspecies. *Copeia* 1989, (3):597-602.
- Ota, H., Kamezaki, N., Hikida, T., Matsui, M., Mori, A., Hayashi, T. and Tanabe, S. 1991. Karyotype of *Achalinus spinalis* from Japan: The first karyological description of a xenodermine snake (Colubridae). *Japanese Journal of Herpetology* 14:12-14.
- Peters, W. C. H. 1869. Über neue Gattungen und neue oder weniger bekannte Arten von Amphibien (*Eremias*, *Dicrodon*, *Euprepes*, *Lygosoma*, *Typhlops*, *Eryx*, *Rhynchonyx*, *Elapomorphus*, *Achalinus*, *Coronella*, *Dromicus*, *Xenopholis*, *Anoplodipsas*, *Spilotes*, *Tropidonotus*). *Monatsber. k. preuss. Akad. Wiss. Berlin*, 1869:432-447.
- Pyron, R. A., Burbrink, F. T. and Wiens, J. J. 2013. A phylogeny and revised classification of Squamata, including 4161 species of lizards and snakes. *BMC Evolutionary Biology* 13:1-53.
- Reinhardt, J. T. 1836. Afhandling om *Xenodermus javanicus*. Oversigt over det Kongelige Danske videnskabernes selskabs forhandling. *Kjøbenhavn* 3:6-7.
- Ride, W. D. L. (ed.) et al. (on behalf of the International Commission on Zoological Nomenclature) 1999. *International code of Zoological Nomenclature* (Fourth edition). The Natural History Museum - Cromwell Road, London SW7 5BD, UK (also commonly cited as "The Rules", "Zoological Rules" or "ICZN 1999").
- Robinson, H. C. and Kloss, C. B. 1920. A nominal list of the species of reptiles and batrachians occurring in Sumatra. *J. fed. Malay States Mus.*, 8(2):297-306.
- Rovatsos, P. M., Johnson, M. and Kratochvíl, L. 2015. Differentiation of Sex Chromosomes and Karyotype Characterisation in the Dragonsnake *Xenodermus javanicus* (Squamata: Xenodermatidae). *Cytogenet Genome Res.*, DOI: 10.1159/000441646
- Sang, N. V., Cuc, H. T. and Nguyen, Q. T. 2009. *Herpetofauna of Vietnam*. Chimaira, Frankfurt:768 pp.
- Savage, J. M. 2015. What are the correct family names for the taxa that include the snake genera *Xenodermus*, *Pareas*, and *Calamaria*? *Herpetological Review* 46(4):664-665.
- Sharma, R. C. 2004. *Handbook Indian Snakes*. Akhil Books, New Delhi:292 pp.
- Shie, J. 2005. Phylogeography of Odd-scaled Snake *Achalinus* in Taiwan. Masters thesis, National Sun Yat-sen University:53 pp.
- Smith, M. A. 1930. The Reptilia and Amphibia of the Malay Peninsula. *Bull. Raffles Mus.*, 3:i-xviii+1-149.
- Smith, M. A. 1943. *The Fauna of British India, Ceylon and Burma, Including the Whole of the Indo-Chinese Sub-Region. Reptilia and Amphibia. 3 (Serpentes)*. Taylor and Francis, London:583 pp.
- Steindachner, F. 1913. Über zwei neue Schlangenarten aus Formosa. *Anz. Kaiserl. Akad. Wiss. Wien, Math.-Nat. Ser.* 50:218-220.
- Stejneger, L. H. 1907. Herpetology of Japan and adjacent territory. *Bull. US Natl. Mus.* 58: xx+1-577.
- Stejneger, L. H. 1910. The batrachians and reptiles of Formosa. *Proc. US Natl. Mus.* 38:91-114.
- Stuebing, R. B. and Inger, R. F. 1999. *A field guide to the snakes of Borneo*. Natural History Publications (Borneo), Kota Kinabalu:254 pp.
- Taylor, E. H. 1965. The serpents of Thailand and adjacent waters. *Univ. Kansas Sci. Bull.* 45(9):609-1096.
- Teynié, A., David, P. and Ohler, A. 2010. Note on a collection of Amphibians and Reptiles from Western Sumatra (Indonesia), with the description of a new species of the genus *Bufo*. *Zootaxa* 2416:1-43.
- Toriba, M. 1993. Present location of the type specimens described by Maki. *The Snake* 25:71-72.
- Tweedie, M. W. F. 1983. *The snakes of Malaya*. (Third edition). Singapore National Printers, Singapore:1-167+12 plates.
- Van Denburgh, J. 1912. *Advanced diagnoses of new reptiles and amphibians from the Loo Choo Islands and Formosa*. Privately published by author, San Francisco:8 pp.
- Victorian Civil and Administrative Tribunal (VCAT). 2015. *Hoser v Department of Environment Land Water and Planning (Review and Regulation)* [2015] VCAT 1147 (30 July 2015).
- Volz, W. 1904. Schlangen von Palembang (Sumatra) (Reise von Dr. Walter Volz). *Zool. Jahrb. Jena, (Syst.)*, 20(5):491-508.
- Welch, K. R. G. 1988. *Snakes of the orient: a checklist*. Robert F. Krieger Publishers, Malabar, Florida, USA:i-vii+183 pp.
- Werner, F. 1900. Reptilien und Batrachier aus Sumatra, gesammelt von Herrn Gustav Schneider jr. im Jahre 1897-98. *Zool. Jb.*, (Abt. Sydt.), 13(6):479-508, pl.31-35.
- Werner, F. 1922. Synopsis der Schlangenfamilien der Amblycephaliden und Viperiden nebst Übersicht über die kleineren Familien und die Colubriden der Achromochordinengruppe. Auf Grund des Boulengerschen Schlangenkatalogs (1893-1896). *Arch. Naturgesch.* Berlin, (A), 88(8):185-244.
- Ziegler, T. 2002. *Die Amphibien und Reptilien eines Tieflandfeuchtwald-Schutzgebietes in Vietnam*. Natur und Tier Verlag (Münster):342 pp.
- Zong, Y. and Ma, J. 1983. A new species of the genus *Achalinopsis* from Jiangxi and the restoration of this genus. *Acta Herpetologica Sinica* 2(2):61-63.

**CONFLICT OF INTEREST**

The author has no known conflicts of interest in terms of this paper and conclusions within.

## Australasian Journal of Herpetology®

Publishes original research in printed form in relation to reptiles, other fauna and related matters, including the subjects of classification, ecology, public interest, captivity, "academic misconduct", etc. It is a peer reviewed printed journal published in hard copy for permanent public scientific record in accordance with the *International Code of Zoological Nomenclature* (Ride et al. 1999), with a sizeable print run and has a global audience.

Full details of acquiring copies, either printed or in identical form online, editorial policies, publication procedure, author submission guidelines, peer review guidelines, legal matters, advantages of publication in this journal and the like can be found by following links from:

<http://www.herp.net>

**Published by Kotabi Pty Ltd**  
**PO Box 599**  
**Doncaster, Victoria, 3108.**  
**Australia.**

**Copyright. All rights reserved.**

**Online journals (this issue) do not appear for a month after the actual and listed publication date of the printed journals. Minimum print run of first printings is always at least fifty hard copies.**

**ISSN 1836-5698 (Print)**  
**ISSN 1836-5779 (Online)**

# A second new *Tropidechis* Günther, 1863 from far north Queensland (Squamata: Serpentes: Elapidae).

RAYMOND T. HOSER

488 Park Road, Park Orchards, Victoria, 3134, Australia.

Phone: +61 3 9812 3322 Fax: 9812 3355 E-mail: snakeman (at) snakeman.com.au

Received 2 February 2016 Accepted 12 March 2016, Published 1 August 2016.

## ABSTRACT

The Australian Rough-scaled Snakes *Tropidechis* Günther, 1863, were formally divided by Hoser (2003) into two divergent species. These were the long-recognized *T. carinatus* (Krefft, 1863) from northern New South Wales and south-east Queensland, and the population from the wet tropics of far north-east Queensland, formally named as *T. sadlieri* Hoser, 2003.

The two species are separated by a straight line distance of about 1,000 km at their closest points.

Inspection of further specimens from the wet tropics has yielded two morphologically distinct and geographically isolated populations in the area. The nominate form of *T. sadlieri* is from the southern wet tropics, this area being Mount Spec in the south to Bellenden Ker, just south of Cairns in the north. The as yet unnamed population is found in the northern wet tropics in the region from Julatten/Mount Lewis in the south to at least the Windsor Tableland/Thornton Peak area in the north.

It is herein formally named as *T. jessejacksoni* sp. nov. in honour of Jesse Louis Jackson, Sr. a well-known American civil rights activist, Baptist minister, and politician, in recognition of his lifetime's struggle for the basic human rights for non-white citizens of the United States of America.

The taxon is named in accordance with the provisions of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

**Keywords:** Taxonomy; Snakes; North Queensland; Queensland; Australia; wet tropics; northern wet tropics; Mount Lewis; Cairns; Julatten; Windsor Tableland; *Tropidechis*; *carinatus*; *sadlieri*; new species; *jessejacksoni*.

## INTRODUCTION

Following some years of field research, inspection of numerous live specimens in captivity and inspection of *Tropidechis* holdings in the Melbourne, Sydney and Brisbane Museums, Hoser (2003) divided the two widely disjunct populations of the Rough-scaled Snake *Tropidechis carinatus* (Krefft, 1863) into two species. Until then, *Tropidechis* Günther, 1863 had been treated by all herpetologists as being monotypic for the one species.

The most obvious differences between the southern taxon from south-east Queensland and north-east New South Wales and the putative northern species from the wet tropics of north-east Queensland, were spelt out by Hoser (2003) in the formal description of *T. sadlieri* Hoser, 2003.

Notwithstanding the unscientific denials of the obvious by a band of thieves known as the Wüster gang, who as of end 2015 were still denying the existence of the taxon *T. sadlieri* as detailed on the website the gang control called the "Reptile Database" at <http://reptile-database.reptarium.cz/species?genus=Tropidechis&species=carinatus>, which as of 12 December 2015 stated "Synonymy: *Tropidechis sadlieri* is probably a synonym of *T. carinatus* (Wilson & Swan 2008, Wüster, pers. comm., 15 Dec 2010)."; the specific status of *T. sadlieri* has been near universally recognized by Australian herpetologists since the date of the original description.

By way of corroboration, I merely note that no other single rainforest obligate species has a distribution that includes and is restricted to south-east Queensland/Northern New South Wales rainforests and those of the north Queensland wet tropics. Those species long thought of as inhabiting both regions (e.g. *Phyllurus cornutus* Ogilby, 1892, a species more recently transferred to the genus *Saltuarius* Couper, Covacevich and Moritz, 1993), was split into several species some years back as detailed in Cogger (2014).

An audit of rainforest obligate species in the wet tropics of Australia, by myself in the period post-dating the 2003 description of *T. sadlieri*, has found many putative species from the region being actually composite. This has usually been a situation of two species, one in the southern wet tropics and another in the northern wet tropics, separated by a gap zone sited in the general area between Cairns in the south and Julatten/Mount Lewis in the north.

Some of these putative species as identified by Cogger *et al.* (1983) that I have found to be actually two and divided by this barrier include *Saltuarius cornutus* Ogilby, 1892 (the southern population being the nominate form), *Carphodactylus laevis* Günther, 1897 (the southern population being the nominate form) and *Gnypetoscincus queenslandiae* (De Vis, 1890) (the southern population being the nominate form) for all of which

molecular evidence is available and which confirms species level divergences.

With this in mind, putative *T. sadlieri* were revisited to see if A/ These snakes were divided by the same barrier and B/ If snakes on either side of the gap were the same or different.

These were the two questions asked (or hypotheses to be tested) and the answers were arrived at in the first instance by simple checking of the Museum databases to see where specimens had been found.

Notwithstanding the ability of snakes such as *Tropidechis* species to hitch rides from place to place and so be caught and recorded from locations that they do not originate from, the Museum databases for Australian holdings showed the well defined gap from Cairns to Julatten/Mount Lewis having an absence of specimens.

Not one single animal had been either lodged in a museum, or reported on other specimen databases by way of "human observation" or the like.

While this could be attributed to non-collection in this zone, this is thought unlikely due to the regular fieldwork in the area and significant human presence in the region, but not of such a degree as to exterminate such snakes if present.

Of relevance also is the active capture and removal of all local species of snakes by government licensed snake handlers from properties in the area, which again has failed to yield a single *Tropidechis* specimen.

Due to the nature of the job of snake catchers in a given area and that over time, all locally occurring species are found and caught by the snake catchers, the non-capture of *Tropidechis* in the relevant gap zone, implies in the strongest possible terms of a genuine absence.

As for the snakes themselves, while the number of specimens from the northern wet tropics was small (I was only able to inspect less than ten in total), versus about 30 from the southern wet tropics (still a small number), the differences between both groups was stark and consistent, as most readily evidenced in the configuration of the labial scales. With these being a conservative character in terms of morphological evolution, it is clear that the two populations have been separated for an extended geological period and not just the beginning of the most recent interglacial about 12,500 years ago.

Being aware of the fact that for most of the Pleistocene, the climate in the region has been drier and that *Tropidechis* is in the normal course of events a rainforest obligate species, it is likely that the range of these snakes in north Queensland has expanded in the recent past (last 12,500 years), rather than contracted and that the affected populations have been isolated over a time line similar to that indicated by the molecular evidence for the relevant Carphodactylidae species as outlined by Couper, Covacevich and Moritz (2000) or for putative *Gnypetoscincus queenslandiae* as detailed by Moritz *et al.* (1993).

For putative *Gnypetoscincus queenslandiae* Moritz *et al.* (1993) found the two populations diverged over 5 million years ago. Significantly and in spite of presumed Holocene expansion of the two *Tropidechis* populations in north Queensland, they have not yet met and so remain isolated from one another and continue to evolve as separate species.

On the basis of the obvious differences between the two populations of these snakes and continued isolation of each, I have absolutely no hesitation in naming the northern population as a new species.

Of peripheral relevance and noting the ability of snakes in general to traverse substantial distances, including others within the broader so-called "Notechis clade" as outlined by Sanders *et al.* (2008) and the four relevant sources cited therein, of which *Tropidechis* is part, the question I was not able to answer was why these snakes have been apparently unable to breach the

gap between the two populations.

I am presuming it is more likely to be a predator in the lowlands or drier habitats, as opposed to thermal or other properties of the intervening habitat itself. However the inability of *Tropidechis* to breach dry zones between habitats is evident also in the southern population from south-east Queensland and nearby New South Wales.

Many rainforest obligate species and genera of reptiles and frogs (e.g. *Adelynhosersaur* Hoser, 2013, *Mixophyes* Günther, 1864), were able to cross the dry zone of the Hunter Valley in New South Wales, to be able to inhabit rainforests, south of here, thus occupying both sides of this gap as indicated by the relevant distribution information in Hoser (1989) and/or Cogger (2014). However *Tropidechis* was unable to do so, only being found north of this gap and not in areas of suitable habitat to the south (Hoser 1989, Cogger, 2014).

Hence I have no doubt as to the effectiveness of the barrier between the southern wet tropics population and the northern wet tropics populations of *Tropidechis* in the recent geological past, including in the period preceding the most recent interglacial.

Also of relevance to this paper and the diagnosis of the new species, I must mention a significant error in my book *Australian Reptiles and Frogs* (Hoser, 1989).

On page 173 at the top right hand corner, I produced a photo captioned "Rough-scaled Snake *Tropidechis carinatus* (Jellaten, QLD)."

The town "Jellaten" is in fact spelt "Julatten", but that is not a serious error as the mistake is obvious and so no confusion is likely to have occurred.

The taxonomy used, reflected that at the time and as the book was not about changing taxonomy or nomenclature, the identification of the snake as "*Tropidechis carinatus*" was also in order.

More significantly the snake depicted is almost certainly NOT from Julatten as indicated. This I know as the head scalation does not conform with those from Julatten, but rather it conforms to the southern wet tropics form instead, defined herein as *T. sadlieri*. The northern wet tropics form from Julatten has different scalation as outlined in the formal description of the new species below.

As to how the errors occurred, an explanation is required.

The snake photographed was in a cage at the private home of a Mr. Michael Cermak, who at the time when the photo was taken in early 1983 lived at Manunda, Queensland.

He advised me of the alleged collection locality of the snake and wrote down the spelling of "Jellaten" on a piece of paper, both of which were later transcribed to the slide mounts and then into the book when it was published 6 years later.

It has since emerged that Mr. Cermak is at best described as unreliable, or perhaps better described as complete liar and crook. To this end, he has established a reputation for making false and unreliable statements for his own commercial purposes. In recent years (2010-2016) he has regularly made wild and ridiculous claims on social media (e.g. Facebook), meaning that any information that may now be volunteered by Cermak about the relevant snake would have to be dismissed as unreliable in any event.

While I could guess that the relevant snake came from a third party and hence Cermak may not have even known where it came from, this is speculation only. He may have caught it himself!

The only thing about the snake that is certain as of end 2015 is that it is 1/ A north Queensland *Tropidechis* and 2/ It is almost certainly NOT from Julatten in Queensland.

These facts need to be made known here as the relevant photo published in Hoser (1989) has also been published on the internet since and reposted widely. People should be made

aware of the error as they should not get the misguided idea that it is a typical example of the newly described species *T. jessejacksoni* sp. nov. when it is not.

I also note that, notwithstanding the theft of relevant materials from this author in an illegal armed raid on 17 August 2011, which were not returned in breach of undertakings to the court (Court of Appeal Victoria 2014 and VCAT 2015), I have made a decision to publish this paper.

This is even though significant data on specimens of all three relevant species gathered over some decades were unlawfully taken and never returned.

This is in view of the conservation significance attached to the formal recognition of unnamed taxa and on the basis that further delays may in fact put the new previously unnamed species at greater risk of extinction.

This comment is made noting the extensive increase in human population in Australia and the general environmental destruction across the continent as documented by Hoser (1991), including low density areas without a large permanent human population.

I also note the abysmal environmental record of Australian governments in the past 200 years as detailed by Hoser (1989, 1991, 1993 and 1996).

#### **TROPIDECHIS JESSEJACKSONI SP. NOV.**

**Holotype:** A preserved specimen in the Queensland Museum, Brisbane, Queensland, Australia, specimen number: J71451, collected at Picaninny Ck, Windsor Tableland, North Queensland, Australia, Latitude -16.20, Longitude 144.97. The Queensland Museum, Brisbane, Queensland, Australia, is a government-owned facility that allows access to its holdings.

**Paratypes:** Three preserved specimens in the Queensland Museum, Brisbane, Queensland, Australia, specimen numbers: J41526 and J52857 collected at Mount Lewis, via Mount Molloy, North Queensland, Australia, Latitude -16.58, Longitude 145.28 and the third preserved specimen collected 16km from Mount Molloy on the Mount Lewis Road, North Queensland, Australia, Latitude -16.58, Longitude 145.22.

**Diagnosis:** The three species of *Tropidechis* Günther, 1863 are readily separated from one another on the basis of head scalation.

In the absence of reliable locality data, the simplest way to separate the three species (*carinatus* Günther, 1863 versus *sadlieri* Hoser, 2003 and *jessejacksoni* sp. nov.) is by a cursory look at the frontal scale. In *T. carinatus* this scale is always widest at the front point where it joins the supraoculars (on each side) at the point where the front border of the supraocular runs towards the sides of the head and borders the prefrontals. For *T. sadlieri* and *T. jessejacksoni* sp. nov. the frontal shield is widest where it joins the supraoculars at the point where the supraoculars join the parietal shields. Rarely, in *T. sadlieri* and *T. jessejacksoni* sp. nov., these two measurements are more-or-less the same, but still the front point is not distinctly wider as in *T. carinatus*.

The best way to see this (in the first instance) is by comparative observation of the relevant head shields of specimens of both species, or by looking at photos of the same.

*T. carinatus* is also separated from *T. sadlieri* and *T. jessejacksoni* sp. nov. by the nasal scale's properties. In *T. sadlieri* and *T. jessejacksoni* sp. nov. this scale is generally more circular in form and lacks a distinct bulging back as in *T. carinatus*. The nasal in *T. sadlieri* and *T. jessejacksoni* sp. nov. still has a raised surface posterior to the nostril.

Once again, the best way to see this (in the first instance) is by comparative observation of the relevant head shields of specimens of the three species, or by looking at photos of the same.

All three *Tropidechis* species can be readily separated from one another by the upper labial scales.

In all species in the normal situation there are seven on each

side, unless any are abnormally fused, this being obvious when it occurs by the scale being abnormally elongated (laterally) as compared to the others when viewed laterally.

Labial number 6 (heading in a posterior direction) in *T. jessejacksoni* sp. nov. either does not touch the jawline, being cut off by labials 5 and 7, or if it does, it does so only just and at a very narrow point. By contrast in both *T. sadlieri* and *T. carinatus*, labial 6 is more-or-less normal in that it is squarish and abuts the jawline by a normal wide boundary (as opposed to being diamond-shaped in *T. jessejacksoni* sp. nov.).

Limited numbers of *T. carinatus* from the Mount Glorious area in South East Queensland, do have labial 6 tending towards being diamond-shaped, but in these snakes, the lower boundary sits on the jawline by a wide section and so cannot be confused with *T. jessejacksoni* sp. nov..

The front upper labials, those being between the eye and the nasal are relatively short in *T. carinatus*. In that species, the result is that the suture line running along the top of these scales runs into the lower part of the nasal scale, running more-or-less continuous with the lower line, as opposed to joining midway between the upper and lower line of the nasal.

In both *T. sadlieri* and *T. jessejacksoni* sp. nov. the same upper labials are higher and as a result the suture line running along the top of these scales runs into mid part of the nasal scale, running more-or-less continuous with the middle of the scale and not with either the upper or lower line.

The shape of the preocular in *T. carinatus* is squarish, versus irregular in *T. sadlieri* and *T. jessejacksoni* sp. nov..

The nasal scale, past the nostril is heavily reduced in *T. jessejacksoni* sp. nov. being tiny in that section, versus being of similar size, both front and behind the nostril in both *T. sadlieri* and *T. carinatus*, although slightly smaller posteriorly than anteriorly.

The genus *Tropidechis* is defined as follows: A dangerously venomous genus of snakes (Gow 1983, Trinca, Craydon, Covacevich and Limpus 1971). The venom is not only strongly neurotoxic, but it also affects the blood and causes severe muscle damage (Gow 1983).

It is generally separated from all other Australian elapids by its strongly keeled scales along all or most of its body (Cogger 2000). Unlike Death Adders (Genus *Acanthophis*) which may sometimes have strongly keeled scales (particularly on the head and forebody) this species does not have a tail that terminates in a well-defined spine.

Attaining an average adult length (total) of between .75 and 1 metre, more than one death has been attributed to *Tropidechis*, including the case of a 59 year old man dying within 5 minutes after being bitten 3 times on the hand.

The natural history of the species is discussed by Beard (1979). Male combat has not been recorded in *Tropidechis* to date.

However based on the fact that adults are of similar size and that Shine (1991) reported a sample of males being on average a miniscule amount longer than a similar sample of females, the possibility of male combat in *Tropidechis* should not be discounted (Hoser 2003).

**Distribution:** The Northern Wet tropics of Queensland, Australia in an area bounded by Julatten/Mount Lewis in the south to at least the Windsor Tableland/Thornton Peak area in the north.

*Tropidechis sadlieri* Hoser, 2003 is confined to the Southern Wet Tropics of Queensland, Australia in the area from Mount Spec in the south to Bellenden Ker, just south of Cairns in the north and including the Atherton Tableland. *Tropidechis carinatus* is found in a broad zone stretching from the wet northern parts of the Sunshine Coast in Queensland, south through the wetter ranges and nearby areas to the dry zone of the Hunter Valley in the mid north coast of New South Wales and including Barrington Tops north-west of there.

**Etymology:** Named in honour of Jesse Louis Jackson, Sr. a well-known American civil rights activist, Baptist minister, and

politician, in recognition of his lifetime's struggle for the basic human rights for non white citizens of the United States of America, a battle he has unfortunately not come even close to winning, which is a fact that should make people of all racial backgrounds ashamed.

#### REFERENCES CITED

- Beard, D. J. 1979. Rough-scaled snake, *Tropidechis carinatus*. *Herpetofauna* 10:26-28.
- Cogger, H. G. 2000. *Reptiles and Amphibians of Australia* (sixth edition), Reed/New Holland, Sydney, Australia:808 pp.
- Cogger, H. G. 2014. *Reptiles and Amphibians of Australia*, 7th ed. CSIRO Publishing, Australia:xxx+1033 pp.
- Cogger, H. G., Cameron, E. E. and Cogger, H. M. 1983. *Zoological Catalogue of Australia (1): Amphibia and Reptilia*. Australian Government Publishing Service, Canberra, ACT, Australia:313 pp.
- Couper, P. J., Schneider, C. J., Hoskin, C. J. and Covacevich, J. A. 2000. Australian leaf-tailed geckos: phylogeny, a new genus, two new species and other new data. *Memoirs of the Queensland Museum* 45(2):253-265.
- Court of Appeal Victoria. 2014. Hoser v Department of Sustainability and Environment [2014] VSCA 206 (5 Sept).
- de Vis, C. W. 1886. On certain geckos in the Queensland Museum. *Proceedings of the Linnean Society of New South Wales* (2)1(1):168-170.
- Gow, G. F. 1983. *Snakes of Australia* (revised edition), Angus and Robertson, Sydney, Australia:118 pp and 48 plates.
- Günther, A. 1864. Third contribution to our knowledge of batrachians from Australia. *Proceedings of the Zoological Society of London* 1864:46-49 [46, pl. 7 fig. 1].
- Günther, A. 1897. Descriptions of new species of lizards and of a treefrog from north-eastern Queensland. *Novitates Zoologicae, Zoological Museum, Tring*, 4:403-406.
- Hoser, R. T. 1989. *Australian Reptiles and Frogs*. Pierson and Co., Mosman, NSW, 2088, Australia:238 pp.
- Hoser, R. T. 1991. *Endangered Animals of Australia*. Pierson Publishing, Mosman, NSW, 2088, Australia:240 pp.
- Hoser, R. T. 1993. *Smuggled: The Underground Trade in Australia's Wildlife*. Apollo Publishing, Moss Vale, NSW, Australia:160 pp.
- Hoser, R. T. 1996. *Smuggled-2: Wildlife Trafficking, Crime and Corruption in Australia*. Kotabi Publishing, Doncaster, Victoria, Australia:280 pp.
- Hoser, R. T. 2003. The Rough-scaled Snakes, Genus: *Tropidechis* (Serpentes:Elapidae), including the description of a new species from far north Queensland, Australia. *Crocodylian - Journal of the Victorian Association of Amateur Herpetologists* 4(2):11-14. (August 2003).
- Hoser, R. T. 2013. A seven way division of the Amphibolurinae (Squamata: Sauria: Agamidae). *Australasian Journal of Herpetology* 21:33-36.
- Moritz, C., Joseph, L. and Adams, M. 1993. Cryptic diversity in an endemic rainforest skink (*Gnypetoscincus queenslandiae*). *Biodiversity and Conservation* 2:412-425.
- Ogilby, J. D. 1892. Descriptions of three new Australian lizards. *Records of the Australian Museum* 2:6-11.
- Ride, W. D. L. (ed.) et al. (on behalf of the International Commission on Zoological Nomenclature) 1999. *International code of Zoological Nomenclature* (Fourth edition). The Natural History Museum - Cromwell Road, London SW7 5BD, UK.
- Sanders, K. L., Lee, M. S. Y., Leys, R., Foster, R. and Scott Keogh, J. 2008. Molecular phylogeny and divergence dates for Australasian elapids and sea snakes (hydrophiinae): Evidence from seven genes for rapid evolutionary radiations. *Journal of Evolutionary Biology* 21:682-695.
- Trinca, J. C., Craydon, J. J., Covacevich, J. and Limpus, C. 1971. 'The rough-scaled snake (*Tropidechis carinatus*) a dangerously venomous Australian Snake', *Medical Journal of Australia*:801-809.
- Uetz, P. 2015. Webpage at: <http://reptile-database.reptarium.cz/species?genus=Tropidechis&species=carinatus> downloaded on 12 December 2015.
- Victorian Civil and Administrative Tribunal (VCAT). 2015. *Hoser v Department of Environment Land Water and Planning* (Review and Regulation) [2015] VCAT 1147 (30 July 2015, judgement and transcript).
- Wilson, S. and Swan, G. 2008. *A complete guide to reptiles of Australia*. New Holland Publishers, Sydney, Australia:512 pp.

#### CONFLICT OF INTEREST

The author has no known relevant conflicts of interest.

### Australasian Journal of Herpetology ®

Publishes original research in printed form in relation to reptiles, other fauna and related matters, including the subjects of classification, ecology, public interest, captivity, "academic misconduct", etc. It is a peer reviewed printed journal published in hard copy for permanent public scientific record in accordance with the *International Code of Zoological Nomenclature* (Ride et al. 1999), with a sizeable print run and has a global audience.

Full details of acquiring copies, either printed or in identical form online, editorial policies, publication procedure, author submission guidelines, peer review guidelines, legal matters, advantages of publication in this journal and the like can be found by following links from:

<http://www.herp.net>

Published by Kotabi Pty Ltd  
PO Box 599  
Doncaster, Victoria, 3108.  
Australia.

Copyright. All rights reserved.

Online journals (this issue) do not appear for a month after the actual and listed publication date of the printed journals. Minimum print run of first printings is always at least fifty hard copies.

ISSN 1836-5698 (Print)  
ISSN 1836-5779 (Online)

# A review of the *Candoia bibroni* species complex (Squamata: Serpentes: Candoiidae: *Candoia*).

RAYMOND T. HOSER

488 Park Road, Park Orchards, Victoria, 3134, Australia.

Phone: +61 3 9812 3322 Fax: 9812 3355 E-mail: snakeman (at) snakeman.com.au

Received 12 April 2016, Accepted 20 May 2016, Published 1 August 2016.

## ABSTRACT

The Pacific Boas, genus *Candoia* Gray, 1842, have been subject of intense taxonomic scrutiny in recent years.

This has included dissections of the three widely recognized putative species. *Candoia carinata* has been most recently split into three full species and a total of ten regionally distinct subspecies (Smith *et al.* 2001). *C. aspera* split into three subspecies (Hoser, 2013) and *C. bibroni* has long been recognized as consisting of two named subspecies, although one of the used names has been misapplied by various authors and is in fact probably a *nomen nudem*.

Taxonomic treatments of the genus (e.g. McDowell 1979) and molecular treatments of the genus (e.g. Austin 2000) have tended to uphold these divisions and shown clearly that if anything, the taxonomic diversity of the group has been grossly understated.

Hoser 2013, utilized these results and formally described *Candoia aspera iansimpsoni*, this being the most recent addition to the genus. Furthermore, by using existing available nomenclature Hoser (2013) placed each of the three well-known putative species into subgenera.

Hoser (2013) also for the first time moved all species into the newly erected family Candoiidae Hoser, 2013 as distinct from the Boidae.

This paper is a result of drawing on these facts, and available specimens of the putative species *C. bibroni*, to create a taxonomy that more properly reflects the morphology and phylogeny.

The complex has been divided into eleven species and one subspecies; all except *C. bibroni* named for the first time.

The division is along obvious morphological and geographical lines and each population is clearly genetically distinct and isolated. By simple analysis they are all significantly divergent. They are therefore evolving as species in the ordinary sense of the word and should be treated as such.

The taxonomy is robust and conservative and in its entirety, in every case reflects recent "splits" of species across the exact same geographical barriers, likely to be affected by the same factors.

This forms a necessary first step to preserving potentially threatened populations, which by virtue of their insular nature, must be treated as vulnerable.

Furthermore it appears that the factor limiting the westward spread of the *C. bibroni* complex in the Solomon Islands has been the Brown Tree Snake, *Boiga irregularis* (Bechstein, 1802).

**Keywords:** Taxonomy; Pacific Boa; snakes; genus; *Candoia*; *bibroni*; *carinata*; *aspera*; *paulsoni*; *iansimpsoni*; *superciliosa*; *schmidti*; *australis*; species; Fiji; Lau Islands; Loyalty Islands; Solomon Islands; Solomons; Rennell, Bellona; San Cristobal; Reef islands; Banks Islands; Tokelau; Samoa; Wallis; Futuna; Rotuma; Kandavu; Vanuatu; New Caledonia; new species; *hoserae*; *woolfi*; *kimmooreae*; *malcolmmaclurei*; *boutrosi*; *Niraikanukiwai*; *Georgemacintyre*; *louisemcgoldrickae*; *simonmccgoldricki*; *jamiekonstandinou*; new subspecies; *georgekonstandinou*.

## INTRODUCTION

The Pacific Boas, genus *Candoia* Gray, 1842, have been subject of intense taxonomic scrutiny in recent years (e.g. (Smith *et al.* 2001, Hoser 2013).

This has included dissections of the three widely recognized putative species. *Candoia carinata* has been most recently split into three full species and a total of eleven regionally distinct subspecies (Smith *et al.* 2001). *C. aspera* into three subspecies (Hoser, 2013) and *C. bibroni* has long been recognized as consisting of two named subspecies, although one of the used names has been misapplied and is in fact a *nomen nudem*.

Taxonomic treatments of the genus (e.g. McDowell 1979) and molecular treatments of the genus (e.g. Austin 2000) have tended to uphold these divisions and shown clearly that if anything, the taxonomic diversity of the group has been understated as compared to taxonomic treatments of other reptiles across the same biogeographical realm.

Hoser 2013, utilized these results and formally described *Candoia aspera iansimpsoni*, this being the most recent addition to the genus. Furthermore, by using existing available nomenclature Hoser (2013) placed each of the three well-known putative species into subgenera.

Hoser (2013) also for the first time moved all species into the newly erected family Candoiidae Hoser, 2013.

This paper goes further, by drawing on these facts, and available specimens of the putative species *C. bibroni*, to marry what is known of the morphology of local populations with what's known from relevant molecular studies and filling in the blanks with relevant geological evidence in terms of land bridges and the like which could aid shifts in populations and specimens to create a taxonomy that more properly reflects the morphology and phylogeny.

The complex has been divided into eleven species; all except for *C. bibroni* are named for the first time.

They are separated along obvious morphological and geographical lines, the latter shown to be major phylogeographic barriers for reptiles in other molecular studies such as Austin (2000), Keogh *et al.* (2008) and others.

It is self evident that they are therefore evolving as species in the ordinary sense of the word and should be treated as such.

An additional subspecies is also named.

The taxonomy presented here is robust and conservative and a necessary first step to preserving potentially threatened populations, which by virtue of their insular nature and ongoing human pressures on the relevant islands, must be treated as vulnerable.

Notwithstanding the theft of relevant materials from this author in an illegal armed raid on 17 August 2011 (Court of Appeal Victoria 2014 and VCAT 2015) and not returned in breach of various earlier court orders, I have made a decision to publish this paper in view of the conservation significance attached to the formal recognition of unnamed species. I also note that further delays may in fact put these otherwise unnamed taxa at greater risk of extinction.

## MATERIALS AND METHODS

These are not formally explained in a number of my recent papers under the heading "Materials and methods" or similar, on the basis they are self evident to any vaguely perceptive reader. However, the process by which the following taxonomy and nomenclature in this and other recent papers by myself of similar form, has been arrived at, is explained herein for the benefit of people who have recently published so-called "criticisms" online of some of my recent papers at the non-peer reviewed website "Facebook". They have alleged a serious "defect" by myself not formally explaining "Materials and methods" under such a heading.

The process involved in creating the final product in terms of taxonomy and nomenclature for this and other relevant papers in

issues 1-32 of *Australasian Journal of Herpetology* has been via a combination of the following:

Genera and component species are audited to see if their classifications are correct on the basis of known type specimens, locations and the like when compared with known phylogenies and obvious morphological differences between like species.

Original descriptions and contemporary concepts of the species are matched with available specimens from across the ranges of the species to see if all conform to accepted norms.

These may include those held in museums, private collections, collected in the field, photographed, posted on the internet or held by individuals.

This is obviously only done when the location data is good and when applicable, other relevant data that is available is also used.

Where specimens do not appear to comply with the described species (and accepted concept of the species), this non-conformation is looked at with a view to ascertaining if it is worthy of taxonomic recognition or other relevant considerations on the basis of differences that can be tested for antiquity or deduced from earlier studies.

When this appears to be the case (non-conformation), the potential target taxon is inspected as closely as practicable with a view to comparing with the nominate form or forms if other similar taxa have been previously named.

Other relevant data is also inspected, including any available molecular studies, geological data and the like which may indicate likely divergence of populations.

Where molecular studies are unavailable for the relevant taxon or group, other studies involving species and groups constrained by the same geographical or geological barriers, or with like distribution patterns are inspected as they give reasonable indications of the likely divergences of the taxa being studied herein.

Additionally other studies involving geological history, sea level and habitat changes associated with long-term climate change, including recent ice age changes in sea levels, versus known sea depths are utilized to predict past movements of species and genus groups in order to further ascertain likely divergences between extant populations (as done in this very paper).

When all available information checks out to show taxonomically distinct populations worthy of recognition, they are then recognized herein according to the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

This means that if a name has been properly proposed in the past, it is used. This is exactly what happens in this paper for the taxon originally described as *Enygrus bibroni* Duméril and Bibron, 1844.

Alternatively, if no name is available, one is proposed according to the rules of the Code as is done numerous times in this paper.

As a matter of trite I mention that if a target taxon or group does check out as being "in order" or properly classified, a paper is usually not published unless some other related taxon is named for the first time.

The published literature relevant to the taxonomic judgements made within this paper includes papers relevant to Solomon Islands and other south-west Pacific Island species affected by the same physical barriers to dispersion. They detail phylogenetic differences between similar taxa from nearby island groups, dispersal dates and the like, geological factors and the like and material directly relevant to *Candoia*. Combined, they include the following:

Adler, *et al.* (1995), Austin (2000), Austin *et al.* (2010), Balsai (1995), Barbour (1921), Bauer (1999), Bauer and Sadler (2000), Bauer and Vindum (1990), Böhme *et al.* (2002), Boulenger (1884, 1885, 1886, 1890, 1893, 1897), Brongniart (1800), Brown



(1991), Bruns *et al.* (1989), Cogger (1972), Colvée and Weffer (2004), Colvée and Martin (2005), Dahl (1986), Daza *et al.* (2015), de Rooij (1917), Duméril and Bibron (1839, 1844), Duméril and Duméril (1851), Forcart (1951), Garman (1901), Gill (1993, 1995), Gray (1856), Greer (1982), Greer and Parker (1967), Greer and Simon (1982), Hagen *et al.* (2012), Hall (2002), Hamilton *et al.* (2010), Harvey *et al.* (2000), Higgins (1943), Hoser (2013), Ineich (2008, 2009, 2011), Iskandar and Erdelen (2006), Jacquinet and Guichenot (1853), Keith and Marquet (2006, 2007), Keith *et al.* (2008, 2011), Keogh *et al.* (2003, 2008), Kinghorn (1928, 1937), Koch *et al.* (2009), Mayr (1931), McCoy (1980, 2006), McDiarmid *et al.* (1999), McDowell (1970, 1979), Medway (1974), Mertens (1928, 1931), Montrouzier (1860), Morrison (2003), Mys (1988), Ogilby (1890), Oxley (2016), Ota *et al.* (1998), Parker (2012), Pianka and Vitt (2003), Pyron *et al.* (2013), Rahmstorf (2003), Reeder (2003), Richmond *et al.* (2014), Rittmeyer and Austin (2015), Robinson (1974), Roemmich (2007), Roux (1913), Russell and Coupe (1984), Sadler and Bauer (1997), Schmidt (2010), Schmidt (1932), Schmidt and Burt (1930), Schweizer (1970), Sibley and Monroe (1990), Wells and Wellington (1985), Williams and Parker (1964), Zug (2012a, 2012, 2013) and sources cited therein.

These papers combined with the findings of McDowell (1979) in terms of morphological divergences in populations, make the argument in favour of splitting the main populations within the *C. bibroni sensu lato* group into full species as opposed to mere subspecies as would otherwise conservatively be the case (see also below).

Some material within descriptions below is repeated for different described taxa and this is in accordance with the provisions of the *International Code of Zoological Nomenclature* and the legal requirements for each description. I make no apologies for this.

## RESULTS

A number of my recent taxonomic papers do not list any results as such under any such heading.

This is because the descriptions that follow the introduction are in fact the results and the outcome arising from these.

The relevant evidence is the animals themselves and from a taxonomic standpoint, the relevant morphological features of them.

Evidence in the form of molecular evidence and geological history can only corroborate the evidence of the animals themselves.

Part of the process of identifying and describing the relevant species or subspecies in this and other papers involves a review of the literature and conclusions drawn by these authors.

I do not necessarily agree with all conclusions of authors in the cited literature and this is usually self-evident when my taxonomic judgements are cross-referenced with the cited papers and the like.

Some authors have clearly made similar taxonomic judgements to myself and others have not.

In the case of my review of the available data, I do herein note a general concurrence in my conclusions from those inferred by McDowell (1979) and Austin (2000) in terms of the species *Candoia bibroni* (Duméril and Bibron, 1844) in that there should be at least two species recognized (see also Zug 2013), one being primarily from the west of the range and the other from the east.

The depth of the divergences is also corroborated by the findings of Hamilton *et al.* (2010), who significantly left *Candoia* out of their results, because they presumably had the belief that specimens on either side of their barrier (the so-called Cheesman's line) were of the same species.

It is in the light of the combined evidence available here, previously unavailable to previous authors on which the current taxonomic and nomenclatural judgements published herein are made.

Hamilton *et al.* (2010) also provide evidence contrary to the view that *Candoia bibroni sensu lato* originated from the Fiji region, dispersing outwards in most directions, indicating that the founder stock may have originated in the Solomon Islands and moved south-east over a substantial time frame by vicariance as much as dispersal.

Sea currents and land mass evidence from glacial maxima also indicate a dispersal eastwards from the Solomons and then south-west from the general vicinity of Samoa, Wallis and Futuna towards Fiji and beyond.

The name *Candoia australis* (Montrouzier, 1860), treated by many authors as either a synonym for *C. bibroni*, (originally named *Boa australis* Montrouzier, 1860) or a subspecies, is not available for any species or subspecies described herein. McDowell (1979) wrote of this alleged taxon: "Montrouzier reported his *Boa australis* to come from New Caledonia, where there are no known terrestrial snakes and his description seems quite unidentifiable."

I note also that the application of the name to the Solomon Islands population by authors in the past century following on from an error by Boulenger also has no tenable basis of fact or availability under the rules of the various editions of Codes of Zoological Nomenclature (e.g. Ride *et al.* 1999).

In terms of this nomenclatural problem, McDowell (1979) wrote: "Just how Boulenger attached Montrouzier's name, based on a color description without scale counts and without known preserved- types, to the form with high ventral count has never been explained, for Montrouzier reported his *Boa australis* to come from New Caledonia, where there are no known terrestrial snakes and his description seems quite unidentifiable."

In other words *Boa australis* Montrouzier, 1860 is at this point in time clearly a *nomen nudem*.

In the alternative, if *Boa australis* Montrouzier, 1860 is not a *nomen nudem*, as first revisor, I hereby restrict the taxon to the type locality, New Caledonia, where no specimens occur.

Also of note is the ultra conservative treatment of the various described taxa.

While two species groups are identified within the *C. bibroni* complex herein (as identified by McDowell 1979 and Zug 2013), I have taken the view that each of the divergent forms within each group should be treated as full species as done below.

The two main groups of species are what I call the *C. bibroni* group from the east and north-east of the range, and the *C. hoserae* sp. nov. group from the north-west of the range.

Diagnostic of the *C. hoserae* sp. nov. group of species is that the *C. hoserae* sp. nov. group is separated from the *C. bibroni* group, by the form of the postorbital bone, which has its ventral (free) end abruptly flexed backward, as in *C. carinata*, rather than forming a simple crescent arc as seen in *C. bibroni*. In the *C. bibroni* group of species the premaxilla has the "typical boine" form described by Frazzetta (1959, 1975), with a large fenestra between the narial vestibules, this fenestra bounded anteriorly by the premaxilla and posteriorly by the nasals; but *C. hoserae* sp. nov. are like *C. carinata* (with which they are sometimes sympatric) in having the intervestibular fenestra largely or entirely filled in by expansion of the premaxilla.

Of note also is that a reassessment of published records and museum specimens indicates that the *C. bibroni* complex is not as widespread as reported in a lot of the literature.

There is currently no evidence the group occurs on any of Tokelau, Tonga, the lower New Hebrides or New Caledonia.

These islands are also biogeographically separated from the islands where the complex is known to occur.

## AN EXPLANATION OF THE PRESENT DAY DISTRIBUTION OF THE *CANDOIA BIBRONI* SPECIES COMPLEX.

Previous authors such as McDowell, 1979 appeared to have difficulty explaining the extant distribution of the complex.

McDowell wrote:

“the distribution of *C. bibroni* appears to centre around the Pandora (or North Fiji) Basin, with a northeastward extension to Samoa, a southwestward extension to the Loyalty Islands, and northwestward extensions to Rennell and San Cristobal. However, it appears impossible to fit the distribution of the species to any known feature of submarine topography. Thus, the New Hebrides Trench has not prevented *C. bibroni* from reaching the Loyalty Islands, yet the species does not extend to New Caledonia (not separated from the Loyalty Islands by any submarine barrier). *C. bibroni* reaches San Cristobal at the eastern end of the Solomons Ridge, but not the adjacent Guadalcanal or Malaita, on the same ridge; *C. bibroni* also reaches Rennell Island, on the eastern end of the Rennell Ridge (essentially continuous with the Louisiade Rise) but does not extend to the Louisiade Archipelago. In extending to Samoa, *C. bibroni* crosses the Tonga Trench and leaves the Melanesian Plateau.”

To this extent, McDowell has identified the known range of the complex, but without identifying the means of dispersal.

A check of the geological history of the relevant island groups indicates at least 11 populations that have never been in land contact with one another meaning that the snakes must have either swam, or more likely “rafted” between the relevant land masses.

This is relatively simple over a geological time frame measured in the millions of years when one looks at the prevailing sea currents in the region. The entire distribution of the *C. bibroni* complex clearly corresponds to the flow of the Equatorial Countercurrent and the South Pacific Gyre as detailed by Rahmstorf (2003), Roemmich (2007) and D’Hondt *et al.* (2009).

In fact it doesn’t seem necessary to identify where the snakes originated, as the South Pacific Gyre would clearly transport rafting snakes to all known localities.

Having said this, based on the morphological evidence of McDowell and the distributional evidence for *Candoia* as a whole, centred on the islands north of New Guinea, including those accreted to it in the last few million years, it would appear that the *Candoia bibroni* group had its origins in the Solomon Islands rather than Fiji.

Alternatively, if Fiji is the point of origin for the three species groups, then Fijian animals most likely founded all the other putative species, including the *C. hoseae* sp. nov. group within *C. bibroni sensu lato*.

The molecular evidence of Austin (2000) also demonstrates that the relevant snakes had clearly been able to raft across significant bodies of water in order to colonise the relevant island groups some millions of years ago, from where the populations have evolved more-or-less independently ever since.

The southern migration of the *C. bibroni* complex was almost certainly limited by temperature, in that the climate further south was simply unsuitable for these particular snakes.

Hence these snakes are not found in places like New Zealand or Norfolk Island.

The factor keeping the snakes from colonising New Caledonia is not emphatically known, although it seems to apply to other species groups from the same distributional realm as *C. bibroni sensu lato*, implying the local sea currents may exclude passage to the island, even though the nearby Loyalty Islands group were reached.

However the factor keeping the *Candoia bibroni* complex from colonising any parts of tropical or eastern Australia, the western parts of the Solomon Islands and the Louisiade Archipelago is in my view clearly obvious.

These areas are inhabited with a highly invasive, nocturnal predatorial tree snake in the form of the Brown Tree Snake *Boiga irregularis* (Bechstein, 1802).

These snakes, which live in high densities, clearly must have

prevented rafting *C. bibroni* complex snakes from establishing. Both species share the same ecological niche and nocturnal habits and would clearly compete directly for food. *B. irregularis* would have a direct competitive advantage in that their cannibalistic and reptile eating habits are well known as is their ability to live in high density and so overwhelm less numerous competing species.

Based on available evidence of distribution, these factors imply an overwhelming advantage over slower moving more heavy bodied snakes in the same ecospace. With sea currents in the Solomons running east to west as part of the well-established “Indonesian throughflow”, cross island colonisation of *C. bibroni* complex snakes through the Solomon Islands should have been a mere formality, noting the cross sea distances to be rafted were insignificant compared with those traversed in the south Pacific. The same applies for the islands of the Louisiade Archipelago.

This means that in the absence of some particularly effective predator on the other islands, the *C. bibroni* complex snakes would have become established throughout the relevant archipelagos.

The only predatory species in the same ecospace which appears to have a distribution that in total excludes *C. bibroni sensu lato* is *B. irregularis*.

Hoser (1995), detailed how *B. irregularis* effectively caused the elimination of *Hoplocephalus bungaroides* (Schlegel, 1837) from areas north of Sydney harbour. The two species occupied identical habitats where they occur in the Sydney basin, but by being mutually exclusive.

With *B. irregularis* the more recent immigrant to the region, we know emphatically that these snakes have successfully eliminated *H. bungaroides* from sandstone areas in Sydney’s north.

The molecular evidence of Richmond *et al.* (2014) confirmed that *B. irregularis sensu lato* migrated from west to east in the recent geological past, this migration encompassing a region generally bound by Sulawesi in the West and Malaita and Guadalcanal in the east of the Solomon Islands. Notably, it is the next major island to the south-east, namely Makira (AKA San Cristobal) where *Candoia bibroni* complex makes its last stand. In this general vicinity on other islets, uninhabited by *B. irregularis*, and islands to the east and south, also uninhabited by *B. irregularis*, *C. bibroni* complex snakes occur and in abundance.

The division of the Solomon Islands into a western and central sector with *B. irregularis* and a mutually exclusive eastern zone with *C. bibroni* complex snakes is seen in the distribution information for *B. irregularis* and “*C. bibroni*” in McCoy 2006.

There he lists *B. irregularis* as being found in the following places: “Maluku (Moluccas), Sulawesi, New Guinea and adjacent archipelagos, Australia, Solomon Islands. There is also an introduced population on Guam which has exterminated a number of species of native birds on that island. In the Solomons: Bougainville, Shortland, Mono, Choiseul, Ranongga, Vella Lavella, New Georgia, Tetepare, Vangunu, Isabel, Guadalcanal, Ngela, Malaita.”

For the species “*C. bibroni*” he lists the mutually exclusive distribution of “Solomon Islands, Vanuatu, Loyalty Islands, Fiji Islands, Tokelau Islands, Wallis and Futuna, the Samoas, Tonga. In the Solomons: Rennell, Makira, Ugi, Olu Malau, Santa Ana, Santa Cruz, Reef Islands, Vanikoro, Utupua.”

No one, including McCoy, have until now picked up on this mutually exclusive distribution by two species that share a near identical ecological niche.

That this has been overlooked until now is somewhat surprising, especially considering the effect *B. irregularis* has had on Guam, where it was introduced inadvertently and has caused problems ever since as noted by Rodda and Fritts (1992), Rodda and Savidge (2010) and Rodda *et al.* (1999).

Likewise in terms of the Louisiade Archipelago, where McDowell noted the absence of "*C. bibroni*". de Rooij (1917), lists *B. irregularis* as occurring in the Louisiade Archipelago and other nearby islands off the south-east coast of New Guinea, all of which conspicuously lack "*C. bibroni*".

McDowell (1979), spent considerable effort looking in the direction of another species of snake affecting the distributional limits of "*C. bibroni*" in the Solomon Islands and to this effect he spent his efforts looking at the congeneric *C. carinata* (Schneider, 1801) and not surprisingly he drew a blank in terms of any hard evidence implicating that species.

It is prudent for me to copy a sizeable chunk of his paper here to see the basis of his analysis and why he drew a blank in the end in terms of implicating the species *C. carinata* restricting the range or habits of "*C. bibroni*".

McDowell (1979) wrote:

"Over much of its range, *C. bibroni* is either the only snake in the land fauna (Banks Islands, New Hebrides, Samoa, and probably much of eastern Fiji) or is accompanied by a single form obviously adapted to feeding on very small prey (Loyalty Islands, where *Typhlina willeyi* occurs; larger Fiji Islands, where *Ogmodon vitianus* occurs). It should be noted that of the four cases of murid remains in the stomach of my material of *C. bibroni*, two were from the New Hebrides (AMNH 81597, Aoba I.; 81589, Maewo I.) and the others from Fiji (AMNH 40439, Viwa I.; 40451, Vomo I.) It seems possible, therefore, that *C. bibroni* becomes more terrestrial in its foraging in regions where *C. carinata* does not occur.

It must be emphasised that my data are far too meagre to establish a character displacement in behavior, and in morphology, where my data are more extensive, there is no evidence of a "character displacement" in either *C. bibroni* or *C. carinata*, at least no evidence that would fulfill the rigorous requirements of Grant (1972). It is true that western ("Long-tailed") *C. carinata* are more like *C. bibroni* than are eastern ("short-tailed") *C. carinata*, particularly in such features as wide separation of the postorbital from the frontal bone, high subcaudal count, somewhat lower tooth counts (than in eastern *C. carinata*, but still above those of *C. bibroni*), and frequent occurrence of a striped color phase suggestive of some phases of *C. bibroni*. However, the geographic range of the eastern form of *C. carinata* far exceeds the overlap of that form with *C. bibroni* (an overlap confined, so far as known, to San Cristobal and nearby Ugi, Bio, Santa Ana, and Three Sisters Islands, to the Santa Cruz Islands, and Rennell and Bellona). I can see no indication, for example, that *C. carinata* from Guadalcanal, where *C. bibroni* does not occur, are any less-or any more-different from *C. bibroni* than are *C. carinata* from San Cristobal.

So far as variation in *C. bibroni* is concerned, there is nothing to indicate that the populations sympatric with *C. carinata* are morphologically more different from that species than are populations from islands where *C. carinata* does not occur; if anything, there may be some character convergence. Thus, in Fiji and New Hebrides *C. bibroni* the premaxilla has the "typical boine" form of Frazzetta (1959; 1975), with a large fenestra between the narial vestibules, this fenestra bounded anteriorly by the premaxilla and posteriorly by the nasals; but eastern Solomons *C. bibroni* are like *C. carinata* (with which they are sympatric) in having the intervestibular fenestra largely or entirely filled in by expansion of the premaxilla. Again, the highest tooth counts in *C. bibroni* are in specimens from the eastern Solomons and the small size of the vomerine foramen of eastern Solomons *C. bibroni* is a departure from Fiji and New Hebrides specimens and a resemblance to the majority of *C. carinata* skulls. It may be added that the material available to me shows no significant (at 5 percent level) departure of *C. bibroni* from a 1:1 sex ratio or any significant differences in sex ratio from island to island. It is noteworthy that on San Cristobal (and also Guadalcanal) *C. carinata* shows at least a close approximation to a 1:1 sex ratio, with the greatest

preponderance of females over males occurring in the new Georgia Group of the Solomons, where *C. bibroni* does not occur.

If one can judge from the collections of the Whitney South Sea Expedition, the presence of one species of *Candoia* would seem to have no depressing effect on the abundance of the other. The largest collection of *C. bibroni* taken by that expedition was that from San Cristobal, where 18 were taken; the same expedition took 19 *C. carinata* on San Cristobal, the largest collection of that species from a single island made by the Whitney South Sea Expedition."

I also note here that McDowell also found that the largest numbers of both "*C. bibroni*" and *C. carinata* were found on San Cristobal which happens to be the only major island in the Solomons without *Boiga irregularis*, indicating that the tree snake species also has a depressing effect in numbers of *C. carinata* as well as "*C. bibroni*".

As to why *C. carinata sensu lato* and the third species complex within *Candoia*, namely *Candoia aspera* (Günther, 1877) could survive in areas inhabited by *Boiga irregularis*, including all those Solomon Islands inhabited by *B. irregularis* for *C. carinata sensu lato* (usually referred to as *C. paulsoni* (Stull, 1956) for Solomon specimens), the answer is self-evident.

Unlike *C. bibroni sensu lato*, the other two species groups are relatively stout ground-dwelling snakes, not being obligatory tree dwellers, acting significantly outside the competitive niche of *B. irregularis*.

As to why *Boiga irregularis* is not found on San Cristobal and islands east and south of there, the reason is simple and again relates to the prevailing sea currents.

The prevailing current in the region is the well-established "Indonesian throughflow", which flows east to west and thereby forms a so-called headwind against eastward migration of *B. irregularis* by any form of rafting.

All the islands colonised by *B. irregularis* in the Solomons fit one of the following profiles:

1/ The islands were joined in ice-age minima into a single land bridge and so were easily crossed by the invasive snakes, which effectively traversed land bridges and/or proximal islands from greater New Guinea, these land bridges detailed by Hagen *et al.* (2012) and others, including a direct line of connection from Bougainville to Ngela via joined islands in between. I note here that Ngela is directly proximal to the permanently separated Guadalcanal, the two islands split by a very narrow strait.

2/ The other islands colonised, (e.g. the New Georgia group), while never connected by land to the other Solomon Islands invaded by *B. irregularis*, effectively sat downcurrent from more easterly islands that could be colonised via the above-referred to land bridge/s (e.g. Ngela/Guadalcanal) via rafting.

The significance of the exclusionary competitiveness of a Colubrid (*B. irregularis*) to a Candoiid (*C. bibroni sensu lato*) cannot be understated in terms of the study of modern ecosystems and I suspect it is far more common than has been previously suspected across other regions.

Hoser (2014) found the species *Acanthophis pyrrhus* (Boulenger, 1898), to successfully exclude and/or eliminate Pilbara Death Adders *Acanthophis wellsei* Hoser, 1998 from areas they may otherwise cohabit.

Hoser (2014) also confirmed that long term separation of *A. wellsei* caused by intervening populations of *A. pyrrhus* also caused a speciation process to occur in the former, as each population was isolated from one another and currently treated as allopatric subspecies.

The situation of competitive species forming effective barriers to gene flows in other taxon populations to allow speciation to occur, appears to have been largely unexplored in herpetology as a means to find new species. If pursued as a line of enquiry, there is no doubt that more cryptic species of reptile will be found.

### THE FORMATION OF THE TAXONOMIC JUDGEMENTS WITHIN THIS PAPER

As noted by McDowell (1979) and further ascertained by myself since, putative *C. bibroni* are morphologically distinct within the various island groups they are found.

What McDowell (1979) and it seems all authors since him have failed to do, is to try to assess these differences with a view to establishing a taxonomy for the complex. Or if changes in taxonomy are indicated by the evidence, the authors have failed to take the logical next step.

Zug (2013) used McDowell's results to state "Subtle skeletal differences hint that *C. bibroni* might consist of two species, a central Pacific one and a Vanuatu-Solomon Islands one".

Austin (2000) wrote: "Both samples of *C. bibroni* in this study (n = 3) come from the eastern portion of the range (Fiji and Samoa) and thus presumably represent only one form of McDowell's postorbital bone division. Nevertheless, these samples show over 6% sequence divergence. Sampling populations from the western portion of the range in the future may show levels of divergence indicative of specific differentiation within *C. bibroni*."

Of course, many species have been divided on far less than a 6% sequence divergence (e.g. Scrub Python (*Australiasis* Wells and Wellington, 1985) species as defined by Harvey *et al.* 2000) and so the case is already made by Austin (2000) for the Samoan snakes to be split off as a full species.

For the record, Harvey *et al.* erected the species *Australiasis nauta* (Harvey *et al.*, 2000) on the basis of a maximum 1.4% divergence from nominate *A. amethystina* (Schneider, 1801) and other species were named on similarly low divergences.

With the Solomons Islands *C. bibroni* complex snakes clearly more divergent from the Fiji types, they too need to be redefined as a separate species.

However across the range of putative *C. bibroni* there is nothing to suggest that either the Samoan, Solomons Islands or Fiji (main island/Vita Levu) are any more divergent than those different forms from other island groups such as Wallis and Futuna, Rotuma, Loyalty Islands or Vanuatu, meaning that these groups were also looked at to decide whether or not they should be given taxonomic recognition and at what level.

McDowell (1979) when looking at morphological evidence, stated that it implied parallel evolution of each population over the recent geological past, adding to the case that all significant island group populations should be equally recognized at the same taxonomic level (i.e. as species or subspecies).

There appeared to be at least eleven main geographically isolated populations of putative *C. bibroni* which based on consistent criteria should be treated as full species in view of both known divergences based on molecular and geological evidence and the accepted Darwinian concept of a species.

In no particular order, they are

- 1/ Nominat form from Fiji (main island/Vita Levu) and the only form with an available name, as in *C. bibroni*.
- 2/ Lau Group of islands, immediately east of Vita Levu in Fiji.
- 3/ Kandavu, immediately south of Vita Levu in Fiji.
- 4/ Loyalty Islands, east of New Caledonia.
- 5/ Vanuatu, and the Banks Islands.
- 6/ Santa Cruz islands, east of the Solomon Islands.
- 7/ Rennell and Bellona, south of the Solomon Islands.
- 8/ San Christobal (AKA Makira) and small islands immediately north in the Solomon Islands.
- 9/ Rotmuma Island.
- 10/ Wallis and Futuna.
- 11/ Samoa.

All are clearly isolated island groups.

Significantly, all were also isolated in the same way as at present during Pleistocene Ice-Age sea level minima, as

ascertained by way of sea depth records and passages between island groups in excess of 120 metres.

This includes those populations identified herein as species from closely proximate locations such as the three from the Fiji Islands (excluding the distant Rotuma) and the three from the eastern Solomon Islands.

Furthermore as seen in the material cited earlier, each and every island group contains endemic species from genera that have crossed the same ocean barriers and yet subsequently speciated in the relevant island groups.

Hence my view that the putative *Candoia bibroni* from each island group should also be treated as full species, rather than subspecies.

Evidence in the literature cited also suggests that the dispersal for *Candoia bibroni sensu lato* across the existing range was rapid and in the order of 2-5 MYA, which again puts each isolated population at the species level.

Examples for each island group's biogeographic isolation in addition to isolation by sea-water barriers are given as follows: 1-3/ The distributions of the three species from Fiji (listed as 1-3 above) effectively mirror in their entirety the co-evolving Iguana species *Brachylophus* in their distributions, as outlined by Keogh *et al.* (2008).

*Brachylophus fasciatus* (Brongniart, 1800) appears to be endemic to the Lau group of islands.

Robinson (1971) also confirms that the relevant island groups have remained biogeographically separated for a significant period.

The Kadavu fantail *Rhipidura personata* Ramsay, 1876 is a species of bird in the fantail family Rhipiduridae. It is endemic to Kadavu and Ono in the Kadavu Islands, Fiji. On Vita Levu, Fiji it is replaced by the streaked fantail *Rhipidura verreauxi* Marie, 1870. The two similar taxa have speciated in nearby islands due to the same factors isolating the *Candoia*.

4/ Endemism in Pacific genera in the Loyalty Islands is seen in the species *Emoia loyaltiensis* (Roux, 1913), including as referred to by Zug (2012).

5/ There are numerous endemic reptile species from the New Hebrides, including the northern sector. Species include the Toupeed Skink *Emoia sanfordi* Schmidt and Burt (1930), the Vanuatu Coppery Vine Skink *Emoia nigromarginata* (Roux, 1913), the Anatom Tree Skink *Emoia aneityumensis* Medway, 1974, the Eronan Tree Skink *Emoia eronan* Brown, 1991, the Vanuatu Snake-eyed Skink *Cryptoblepharus novohebridicus* Mertens, 1928, the Vanuatu Saw-tailed Gecko *Perochirus guentheri* Boulenger, 1885, the Vanuatu Forest Gecko *Lepidodactylus vanuatuensis* Ota *et al.* 1998 and the Vanuatu Ant-nest Gecko *Lepidodactylus buleli* Ineich, 2008.

Putative *C. bibroni* from the Banks Islands differ from those further south in the New Hebrides and are separated by deep water. But in the absence of a well-defined barrier, they are herein treated as a subspecies of the Vanuatu form.

6-8/ The biogeographical barriers within the Solomon Islands in terms of terrestrial reptiles are well-known. The species *Corucia zebrata* occurs in the San Christobal (AKA Makira) island group, but not in the Santa Cruz islands, east of San Christobal or the Rennell and Bellona islands, south of San Christobal (Hagen *et al.* 2012), meaning each of these populations of putative *C. bibroni* are isolated from one another.

Furthermore the distribution of *Euprepiosaurus juxtindicus* (Böhme *et al.*, 2002) is restricted to Rennell and Bellona islands and nowhere else in the Solomon Islands (or anywhere else for that matter), confirming the isolation of terrestrial reptiles here.

9/ Rotuma Island and its physical and biological isolation is confirmed by unique species such as the Rotuma Forest Gecko *Lepidodactylus gardineri* Boulenger, 1897.

10/ Futuna Island and its physical and biological isolation in terms of terrestrial or non-marine vertebrates is confirmed by

unique species such as the freshwater fish *Stiphodon rubromaculatus* Keith and Marquet, 2007, *Akihito futuna* Keith et al., 2008, *Sicyopus sasali* Keith et al., 2011 and *Stenogobius keletaona* Keith and Marquet, 2006.

11/ Samoa and its physical and biological isolation in terms of terrestrial or non-marine vertebrates is confirmed by unique species such as *Emoia samoensis* (Duméril and Duméril, 1851).

#### GENUS *CANDOIA* GRAY, 1842.

**Type species:** *Boa carinata* Schneider, 1801.

**Diagnosis:** All *Candoia* Gray, 1842 are separated from all other Boas and Pythons and physically similar non-venomous constricting snakes with thick, muscular bodies, by the following suite of characters:

Head distinct from the neck, Snout is obliquely truncate. The canthus rostralis is prominent. Body is slightly compressed. All the dorsal scales are strongly keeled. Subcaudals are all single.

There is a pair of longitudinal folds on each branch of hemipenis dividing each branch into a sulcal and an absulcal field; nasal bones overlapping dorsal surface of frontal bones, thus separating prefrontals on the midline.

**Distribution:** The Pacific Islands from the Samoas in the east to the islands north of New Guinea, including New Guinea and across to Halmahera. Not in Australia, New Caledonia, Tokelau, Tonga or the lower New Hebrides.

#### *CANDOIA BIBRONI* (HOMBRON AND JACQUINOT, 1853).

**Type locality:** Vita Levu, Fiji.

**Diagnosis:** *Candoia bibroni* and other species described in this paper that were formerly treated as populations of *C. bibroni* are herein defined as being the *C. bibroni* species complex.

The *C. bibroni* species group are those species not included in the *C. hoseae* sp. nov. species group, as defined below.

All species within the *C. bibroni* species complex are separated from all other *Candoia* by having supralabials separated from the eye by the subocular scales, versus *C. carinata* (Schneider, 1801) and *C. paulsoni* (Stull, 1956) which have them entering the eye; preocular differentiated; canthus rostralis rounded; a relatively slender body with lengthwise ridges on the body scales that run parallel to the long axis of the body, versus a stout body with keels on the body scales forming oblique rows as in *C. aspera* (Günther, 1877); ventrals 203-266; subcaudals 44-67. Furthermore the tail is more than twice as long as the head, being capable of more than one complete circle of coiling in the vertical plane.

The species *Candoia carinata* (Schneider, 1801) including species and subspecies formerly treated as being within this taxon (e.g. *C. paulsoni* Stull, 1956) is separated from the *C. bibroni* complex by having 2, or rarely 1 or 3 supralabials entering eye; an angulate canthus rostralis, 160-202 ventrals and 35-60 subcaudals.

The species *Candoia aspera* (Günther, 1877) including species and subspecies formerly treated as being within this taxon is separated from the *C. bibroni* complex by having a tail less than twice as long as the head, usually being shorter than the head; is incapable of forming a full circle of coiling in vertical plane; at least on the anterior two-thirds of body are keels of scales forming curved diagonal ridges along the sides, which extend backward and downward towards the belly; 127-153 ventrals; 11-22 subcaudals; no specially enlarged preocular; (supralabials excluded from the eye; canthus rostralis angular).

*Candoia hoseae* sp. nov. and others in the *C. hoseae* sp. nov. species group are defined as the three species from the Solomon Islands, including outliers, as well as the single species from the Banks Islands and nearby New Hebrides.

These species are all separated from *C. bibroni* and others in the *C. bibroni* species group (being all others in the *C. bibroni* complex) by the form of the postorbital bone, which has its ventral (free) end abruptly flexed backward, as in *C. carinata*, rather than forming a simple crescent arc as seen in *C. bibroni*.

In *C. bibroni* the premaxilla has the "typical boine" form described by Frazzetta (1959, 1975), with a large fenestra between the narial vestibules, this fenestra bounded anteriorly by the premaxilla and posteriorly by the nasals; but *C. hoseae* sp. nov. and others in the species group are like *C. carinata* (with which they are sometimes sympatric) in having the intervestibular fenestra largely or entirely filled in by expansion of the premaxilla.

*Candoia bibroni* (Hombron and Jacquinet, 1853) *sensu stricto* as defined in this paper, is the taxon from the main Fiji islands including Viti Levu and Vanua Levu and immediately adjacent islands, but not including Kadavu or the islands in the Lau group, each of which has a different species.

The taxon *C. bibroni* is separated from all other species within the *C. bibroni* species complex by the following suite of characters: A blotched dorsal pattern with distinctive throat stripes and a low ventral count ranging from 207-227 ventrals.

The species *C. bibroni* is further defined by the following suite of characters: 18-22 maxillary teeth, (versus 17-19 in *C. woolfi* sp. nov. from the Lau Group of islands), 53-59 subcaudals (versus 45-56 in *C. woolfi* sp. nov. from the Lau Group of islands), 10-16 supralabials, 12-17 infralabials, 26-30 scale rows behind the head at one head length behind the head (versus 33-34 in *C. woolfi* sp. nov.), 30-37 midbody rows, 19-24 scale rows one headlength anterior to the cloaca, hemipenis forks at subcaudal 6-10.

The species *Candoia woolfi* sp. nov. from the Lau Group of islands, east of the main Fiji islands is separated from all other species within the *C. bibroni* species complex by the following suite of characters: A blotched pattern without stripes. The tail pattern is much more conspicuous than that of body, the pale bordering of body blotches also replacing darker ground color on the tail; 205-236 ventrals; there are 33-34 scale rows behind the head at one head length behind the head (versus 26-30 in *C. bibroni*).

The species *Candoia kimmooreae* sp. nov. from the island of Kadavu, southern Fiji is separated from all other species within the *C. bibroni* species complex by having a blotched pattern which includes a prominent median throat stripe and no lateral throat stripes. Otherwise this taxon is essentially similar in form to nominate *C. bibroni*.

The species *Candoia malcolmaclurei* sp. nov. from the Loyalty Islands, (territory controlled by New Caledonia) is separated from all other species within the *C. bibroni* species complex by having a blotched pattern without stripes and a tail similar in pattern to the body, or alternatively a blotched pattern with throat stripes including a median row of dark spots on anterior ventrals; dark perocular streak from angle of mouth (or angle of jaw) through eye to loreal region, dark spots on lips, and dark spotting on top of head and with a median ventral row of dark spots. Sometimes the colouration is dulled to appear unicolour. The species is further defined by having 13-16 infralabials, 27-30 scale rows on the neck at one head length back, 20-22 scale rows at one headlength anterior to the cloaca, 219-226 ventrals, 53-60 subcaudals and 19-22 maxillary teeth on either side.

The species *Candoia boutrosi* sp. nov. from the islands of Samoa is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: a distinctive blotched dorsal body pattern that is one or other of being distinct or very indistinct, the large dark blotches being the main component of the dorsal midline for the anterior and mid-body, with the lighter blotches dominating the midline posteriorly, reversing on the tail to have the darker blotches dominate on the tail, which remains brightly marked for the whole length. The dorsal colouration is a combination of chocolate brown and beige in distinctly marked animals or a hybrid of this in the indistinctly marked animals. On the head is a well-defined creamish bar on the upper labials above the jawline.

It is also defined as having 12 supralabials bilaterally (in

common with the three species from the Fiji Islands), 15-16 infralabials (as for *C. bibroni sensu stricto*), and 31-32 scale rows on the neck, one head length back from the head (versus 26-30 in *C. bibroni sensu stricto*).

*C. boutrosi sp. nov.* is further defined and separated from the other species in the *C. bibroni* complex by the following suite of characters: 37-38 mid-body rows, 22-24 scale rows at one head length anterior to the cloaca, 237-252 ventrals, 51-61 subcaudals and 16-18 maxillary teeth on either side.

The species *Candoia niraikanukiwai sp. nov.* from the islands of Wallis and Futuna, including nearby islets is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: It is essentially similar in most respects to *C. boutrosi sp. nov.* from which it differs by having a distinctive well-defined stripe running through the eye on either side of the head and the absence of a well-defined creamish bar on the upper labials above the jawline.

The species *Candoia georgemacintyreii sp. nov.* from the island of Rotuma, is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: 235-240 ventrals, 57-63 subcaudals, 37-39 mid body rows and significant lightening of the upper labials; the dorsal pattern is blotched and semi-distinct and there is significant speckling and markings on the venter.

As mentioned already, *Candoia hoserae sp. nov.* and others in the *C. hoserae sp. nov.* species group are defined as the three species from the Solomon Islands, including outliers, as well as the single species from the Banks Islands and nearby New Hebrides.

These are *C. hoserae sp. nov.*, *C. louisemgoldrickae sp. nov.*, *C. simonmcgoldricki sp. nov.* and *C. jamiekonstandinoui sp. nov.*, the latter of which includes the subspecies *C. jamiekonstandinoui georgekonstandinoui subsp. nov.*

These species are all separated from *C. bibroni* and others in the *C. bibroni* species group (being all others in the *C. bibroni* complex) as detailed in the preceding text, by the form of the postorbital bone, which has its ventral (free) end abruptly flexed backward, as in *C. carinata*, rather than forming a simple crescent arc as seen in the *C. bibroni* species group. In the *C. bibroni* species group the premaxilla has the "typical boine" form described by Frazzetta (1959, 1975), with a large fenestra between the narial vestibules, this fenestra bounded anteriorly by the premaxilla and posteriorly by the nasals; but *C. hoserae sp. nov.* and others in that species group are like *C. carinata* (with which they are sometimes sympatric) in having the intervestibular fenestra largely or entirely filled in by expansion of the premaxilla (derived from McDowell, 1979).

*Candoia hoserae sp. nov.* from the island of San Cristobal (AKA Makira) and nearby islets is separated from all other species within the *C. hoserae sp. nov.* species complex by the following unique suite of characters: A striped dorsal body pattern, being light brown with a pair of lengthwise white dorsolateral stripes from over the quadrate bone to near the tail-tip, the stripes edged with brown and a brown streak from angle of mouth almost to eye; the belly is buffy white; 235-257 ventrals and 18-22 maxillary teeth on either side of the mouth.

*Candoia louisemgoldrickae sp. nov.* from the islands of Rennell and Bellona in the Solomon Islands is separated from all other species within the *C. hoserae sp. nov.* species complex by the following unique suite of characters: Similar in most respects to *C. hoserae sp. nov.* from which it can be separated from by the fact that the upper surface of the head is generally dark in colour, the generally dark head and the prominent thin, light temporal streak that runs to the neck is bounded by a distinctive white border at the margins. This taxon is also separated from *C. hoserae sp. nov.* by being of a generally blotched or broken blotched dorsal pattern.

*Candoia simonmcgoldricki sp. nov.* from the Santa Cruz island group, including the nearby Reef Islands within the eastern

Solomon Islands is separated from all other species within the *C. hoserae sp. nov.* species complex by the following unique suite of characters: Similar in most respects to *C. hoserae sp. nov.* and *C. louisemgoldrickae sp. nov.* from which it can be separated from it by a profusion of black pigment on the dorsal snout tip and including the rostral and all of first labial on either side. There is a particularly thick dark postorbital stripe (as opposed to medium in *C. hoserae sp. nov.* and *C. louisemgoldrickae sp. nov.*). 38-41 midbody scale rows in *C. simonmcgoldricki sp. nov.* versus 36-37 in *C. hoserae sp. nov.* and *C. louisemgoldrickae sp. nov.*

The species *Candoia simonmcgoldricki sp. nov.* is further diagnosed and defined by the following: 15-21 infralabials, 250-266 ventrals versus 235-257 for *C. hoserae sp. nov.* and *C. louisemgoldrickae sp. nov.*, 61-64 subcaudals versus 54-63 subcaudals for *C. hoserae sp. nov.* and *Candoia louisemgoldrickae sp. nov.*, 18-22 maxillary teeth, hemipenis fully everted extending from 9-20 subcaudals.

The species *Candoia jamiekonstandinoui sp. nov.* from Vanuatu and the nearby Banks Islands, including nearby islets is separated from all other species within the *C. hoserae sp. nov.* species group by the following unique suite of characters: A distinctive dorsal colouration of pale reddish brown above with semidistinct markings, with a dark brown vertebral stripe edged with yellow and a uniform yellow beneath. Males are unique in the *C. bibroni* species complex in that they have some noticeable dark pigmentation on the hemipenes. 16-18 maxillary teeth for the nominate subspecies, versus 19 in *C. jamiekonstandinoui georgekonstandinoui subsp. nov.*

The subspecies *C. jamiekonstandinoui jamiekonstandinoui subsp. nov.* has 234-247 ventrals, versus 222-225 ventrals in *C. jamiekonstandinoui georgekonstandinoui subsp. nov.*

*C. jamiekonstandinoui georgekonstandinoui subsp. nov.* has the lowest ventral counts of any named taxon within the *C. hoserae sp. nov.* species group.

**Distribution:** The *Candoia bibroni* species group is found on the Fiji Islands, Loyalty Islands (but not New Caledonia), Wallis and Futuna, Samoa Islands and Rotuma.

*Candoia bibroni* is effectively restricted to the main islands of Fiji, including Vita Levu and Ovalau and those immediately north-west.

#### **CANDOIA HOSERAE SP. NOV.**

**Holotype:** A female specimen in the American Museum of Natural History (AMNH), New York, USA, specimen number: AMNH 40407, collected from San Cristobal Island, Solomon Islands.

The American Museum of Natural History (AMNH), New York, USA, allows access to its holdings.

**Paratypes:** Specimens in the American Museum of Natural History (AMNH), New York, USA, specimen numbers: AMNH 40412, 42092, 42093, 42161, 42165, 42166, 42168, 42198, 42199, 42200, 42201, 42202, 42212, 44502 from San Cristobal Island, Solomon Islands.

**Diagnosis:** *Candoia hoserae sp. nov.* and others in the *C. hoserae sp. nov.* species group are defined as the three species from the Solomon Islands, including outliers, as well as the single species from the Banks Islands and nearby New Hebrides, which is herein treated as two separate subspecies, separated by deep water.

These taxa are *C. hoserae sp. nov.*, *C. louisemgoldrickae sp. nov.*, *C. simonmcgoldricki sp. nov.* and *C. jamiekonstandinoui sp. nov.*, the latter of which includes the subspecies *C. jamiekonstandinoui georgekonstandinoui subsp. nov.*

These species are all separated from *C. bibroni* and others in the *C. bibroni* species group (being all others in the *C. bibroni* complex) as detailed in the preceding text, by the form of the postorbital bone, which has its ventral (free) end abruptly flexed backward, as in *C. carinata*, rather than forming a simple

crescent arc as seen in the *C. bibroni* species group. In the *C. bibroni* species group the premaxilla has the "typical boine" form described by Frazzetta (1959, 1975), with a large fenestra between the narial vestibules, this fenestra bounded anteriorly by the premaxilla and posteriorly by the nasals; but *C. hoserae* sp. nov. and others in that species group are like *C. carinata* (with which they are sometimes sympatric) in having the intervestibular fenestra largely or entirely filled in by expansion of the premaxilla (derived from McDowell, 1979).

*Candoia hoserae* sp. nov. from the island of San Cristobal (AKA Makira) and nearby islets is separated from all other species within the *C. hoserae* sp. nov. species complex by the following unique suite of characters: A striped dorsal body pattern, being light brown with pair of lengthwise white dorsolateral stripes from over quadrate bone to near the tail-tip, the stripes edged with brown and a brown streak from angle of mouth almost to eye; the belly is buffy white; 235-257 ventrals, 18-22 maxillary teeth on either side of the mouth.

*Candoia louisemcgoldrickae* sp. nov. from the islands of Rennell and Bellona in the Solomon Islands is separated from all other species within the *C. hoserae* sp. nov. species complex by the following unique suite of characters: Similar in most respects to *C. hoserae* sp. nov. from which it can be separated from by the fact that the upper surface of the head is generally dark in colour, the generally dark head and the prominent thin, light temporal streak that runs to the neck is bounded by a distinctive white border at the margins. This taxon is also separated from *C. hoserae* sp. nov. by being of a generally blotched or broken blotched dorsal pattern.

*Candoia simonmccgoldricki* sp. nov. from the Santa Cruz island group, including the nearby Reef Islands within the eastern Solomon Islands is separated from all other species within the *C. hoserae* sp. nov. species complex by the following unique suite of characters: Similar in most respects to *C. hoserae* sp. nov. and *C. louisemcgoldrickae* sp. nov. from which it can be separated from it by a profusion of black pigment on the dorsal snout tip and including the rostral and all of first labial on either side. There is a particularly thick dark postorbital stripe (as opposed to medium in *C. hoserae* sp. nov. and *C. louisemcgoldrickae* sp. nov.), 38-41 midbody scale rows in *C. simonmccgoldricki* sp. nov. versus 36-37 in *C. hoserae* sp. nov. and *Candoia louisemcgoldrickae* sp. nov..

The species *Candoia simonmccgoldricki* sp. nov. is further diagnosed and defined by the following: 15-21 infralabials, 250-266 ventrals versus 235-257 for *C. hoserae* sp. nov. and *Candoia louisemcgoldrickae* sp. nov., 61-64 subcaudals versus 54-63 subcaudals for *C. hoserae* sp. nov. and *Candoia louisemcgoldrickae* sp. nov., 18-22 maxillary teeth, hemipenis fully everted extending from 9-20 subcaudals.

The species *Candoia jamiekonstandinoui* sp. nov. from Vanuatu and the nearby Banks Islands, including nearby islets is separated from all other species within the *C. hoserae* sp. nov. species group by the following unique suite of characters: A distinctive dorsal colouration of pale reddish brown above with semidistinct markings, with a dark brown vertebral stripe edged with yellow; a uniform yellow beneath. Males are unique in the *C. bibroni* species complex in that they have some noticeable dark pigmentation on the hemipenes. 16-18 maxillary teeth for the nominate subspecies, versus 19 in *C. jamiekonstandinoui georgekonstandinoui* subsp. nov..

The subspecies *C. jamiekonstandinoui jamiekonstandinoui* subsp. nov. has 234-247 ventrals, versus 222-225 ventrals in *C. jamiekonstandinoui georgekonstandinoui* subsp. nov..

*C. jamiekonstandinoui georgekonstandinoui* subsp. nov. has the lowest ventral counts of any named taxon within the *C. hoserae* sp. nov. species group.

*Candoia bibroni* and other species described in this paper that were formerly treated as populations of *C. bibroni* are herein defined as being the *C. bibroni* species complex.

The *C. bibroni* species group are those species not included in the *C. hoserae* sp. nov. species group, as defined below.

*Candoia hoserae* sp. nov. and others in the *C. hoserae* sp. nov. species group are defined as the three species from the Solomon Islands, including outliers, as well as the single species from the Banks Islands and nearby New Hebrides.

These species are all separated from *C. bibroni* and others in the *C. bibroni* species group (being all others in the *C. bibroni* complex) by the form of the postorbital bone, which has its ventral (free) end abruptly flexed backward, as in *C. carinata*, rather than forming a simple crescent arc as seen in *C. bibroni*. In *C. bibroni* the premaxilla has the "typical boine" form described by Frazzetta (1959, 1975), with a large fenestra between the narial vestibules, this fenestra bounded anteriorly by the premaxilla and posteriorly by the nasals; but *C. hoserae* sp. nov. and others in the species group are like *C. carinata* (with which they are sometimes sympatric) in having the intervestibular fenestra largely or entirely filled in by expansion of the premaxilla.

*Candoia bibroni* (Hombron and Jacquinot, 1853) *sensu stricto* as defined in this paper, is the taxon from the main Fiji islands including Viti Levu and Vanua Levu and immediately adjacent islands, but not including Kadavu or the islands in the Lau group, each of which has a different species.

The taxon *C. bibroni* is separated from all other species within the *C. bibroni* species complex by the following suite of characters: A blotched dorsal pattern with distinctive throat stripes and a low ventral count ranging from 207-227 ventrals.

The species *C. bibroni* is further defined by the following suite of characters: 18-22 Maxillary teeth, (versus 17-19 in *C. woolfi* sp. nov. from the Lau Group of islands), 53-59 subcaudals (versus 45-56 in *C. woolfi* sp. nov. from the Lau Group of islands), 10-16 supralabials, 12-17 infralabials, 26-30 scale rows behind the head at one head length behind the head (versus 33-34 in *C. woolfi* sp. nov.), 30-37 midbody rows, 19-24 scale rows one headlength anterior to the cloaca, hemipenis forks at subcaudal 6-10.

The species *Candoia woolfi* sp. nov. from the Lau Group of islands, east of the main Fiji islands is separated from all other species within the *C. bibroni* species complex by the following suite of characters: A blotched pattern without stripes. The tail pattern is much more conspicuous than that of body, the pale bordering of body blotches also replacing darker ground color on the tail; 205-236 ventrals; there are 33-34 scale rows behind the head at one head length behind the head (versus 26-30 in *C. bibroni*).

The species *Candoia kimmooreae* sp. nov. from the island of Kadavu, southern Fiji is separated from all other species within the *C. bibroni* species complex by having a blotched pattern which includes a prominent median throat stripe and no lateral throat stripes. Otherwise this taxon is essentially similar in form to nominate *C. bibroni*.

The species *Candoia malcolmmaclurei* sp. nov. from the Loyalty Islands, (territory controlled by New Caledonia) is separated from all other species within the *C. bibroni* species complex by having a blotched pattern without stripes and a tail similar in pattern to the body, or alternatively a blotched pattern with throat stripes including a median row of dark spots on anterior ventrals; dark perocular streak from angle of mouth (or angle of jaw) through eye to loreal region, dark spots on lips, and dark spotting on top of head and with a median ventral row of dark spots. Sometimes the colouration is dulled to appear unicolour. The species is further defined by having 13-16 infralabials, 27-30 scale rows on the neck at one head length back, 20-22 scale rows at one headlength anterior to the cloaca, 219-226 ventrals, 53-60 subcaudals and 19-22 maxillary teeth on either side.

The species *Candoia boutrosi* sp. nov. from the islands of Samoa is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: a

distinctive blotched dorsal body pattern that is one or other of being distinct or very indistinct, the large dark blotches being the main component of the dorsal midline for the anterior and mid-body, with the lighter blotches dominating the midline posteriorly, reversing on the tail to have the darker blotches dominate on the tail, which remains brightly marked for the whole length. The dorsal colouration is a combination of chocolate brown and beige in distinctly marked animals or a hybrid of this in the indistinctly marked animals. On the head is a well-defined creamish bar on the upper labials above the jawline.

It is also defined as having 12 supralabials bilaterally (in common with the three species from the Fiji Islands), 15-16 infralabials (as for *C. bibroni sensu stricto*), and 31-32 scale rows on the neck, one head length back from the head (versus 26-30 in *C. bibroni sensu stricto*).

*C. boutrosi sp. nov.* is further defined and separated from the other species in the *C. bibroni* complex by the following suite of characters 37-38 mid-body rows, 22-24 scale rows at one head length anterior to the cloaca, 237-252 ventrals, 51-61 subcaudals and 16-18 maxillary teeth on either side.

The species *Candoia niraikanukiwai sp. nov.* from the islands of Wallis and Futuna, including nearby islets is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: It is essentially similar in most respects to *C. boutrosi sp. nov.* from which it differs by having a distinctive well-defined stripe running through the eye on either side of the head and the absence of a well-defined creamish bar on the upper labials above the jawline.

The species *Candoia georgemacintyrei sp. nov.* from the island of Rotuma, is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: 235-240 ventrals, 57-63 subcaudals, 37-39 mid body rows and significant lightening of the upper labials; the dorsal pattern is blotched and semi-distinct and there is significant speckling and markings on the venter.

All species within the *C. bibroni* species complex are separated from all other *Candoia* by having supralabials separated from the eye by the subocular scales, versus *C. carinata* (Schneider, 1801) and *C. paulsoni* (Stull, 1956) which have them entering the eye; preocular differentiated; canthus rostralis rounded; a relatively slender body with lengthwise ridges on the body scales that run parallel to the long axis of the body, versus a stout body with keels on the body scales forming oblique rows as in *C. aspera* (Günther, 1877); ventrals 203-266; subcaudals 44-67. Furthermore the tail is more than twice as long as the head, being capable of more than one complete circle of coiling in the vertical plane.

The species *Candoia carinata* (Schneider, 1801) including species and subspecies formerly treated as being within this taxon (e.g. *C. paulsoni* Stull, 1956) is separated from the *C. bibroni* complex by having 2, or rarely 1 or 3 supralabials entering eye; an angulate canthus rostralis, 160-202 ventrals and 35-60 subcaudals.

The species *Candoia aspera* (Günther, 1877) including species and subspecies formerly treated as being within this taxon is separated from the *C. bibroni* complex by having a tail less than twice as long as the head, usually being shorter than the head; is incapable of forming a full circle of coiling in vertical plane; at least on the anterior two-thirds of body are keels of scales forming curved diagonal ridges along the sides, which extend backward and downward towards the belly; 127-153 ventrals; 11-22 subcaudals; no specially enlarged preocular; (supralabials excluded from the eye; canthus rostralis angular).

**Distribution:** The *Candoia hoserae sp. nov.* species group are found in the Solomon Islands, including San Cristobal (Makira), Rennell, Bellona, Ugi, Olu Malau, Santa Ana, Santa Cruz, Reef Islands, Vanikuro, Utupua as well as the Banks Islands and Vanuatu.

The southern boundary of the species group distribution is the

so-called Cheesman's Line as defined by Hamilton *et al.* (2010), which is a well-known faunal boundary for Pacific island fauna.

*Candoia hoserae sp. nov.* is restricted to San Cristobal (AKA Makira) and immediately adjacent islets including Ugi Island and Olu Malau.

**Etymology:** Named in honour of Maxine Hoser of the United Kingdom for services to herpetology, including logistical assistance's for various past projects.

**CANDOIA SIMONMCGOLDRICKI SP. NOV.**

**Holotype:** A preserved male specimen at the American Museum of Natural History, New York, USA, specimen number: AMNH 40430 collected from Santa Cruz Island, Solomon Islands.

The American Museum of Natural History, New York, USA allows access to its holdings.

**Paratypes:** 1/ A preserved male specimen at the American Museum of Natural History, New York, USA, specimen number: AMNH 42215 collected from Santa Cruz Island, Solomon Islands.

2/ A preserved male specimen at the American Museum of Natural History, New York, USA, specimen number: AMNH 42216 collected from Santa Cruz Island, Solomon Islands.

3/ A preserved female specimen at the American Museum of Natural History, New York, USA, specimen number: AMNH 42160 collected from Santa Cruz Island, Solomon Islands.

**Diagnosis:** *Candoia hoserae sp. nov.* and others in the *C. hoserae sp. nov.* species group are defined as the three species from the Solomon Islands, including outliers, as well as the single species from the Banks Islands and nearby New Hebrides, which is herein treated as two separate subspecies, separated by deep water.

These taxa are *C. hoserae sp. nov.*, *C. louisemcgoldrickae sp. nov.*, *C. simonmcgoldricki sp. nov.* and *C. jamiekonstandinou sp. nov.*, the latter of which includes the subspecies *C. jamiekonstandinou georgekonstandinou subsp. nov.*

These species are all separated from *C. bibroni* and others in the *C. bibroni* species group (being all others in the *C. bibroni* complex) as detailed in the preceding text, by the form of the postorbital bone, which has its ventral (free) end abruptly flexed backward, as in *C. carinata*, rather than forming a simple crescent arc as seen in the *C. bibroni* species group. In the *C. bibroni* species group the premaxilla has the "typical boine" form described by Frazzetta (1959, 1975), with a large fenestra between the narial vestibules, this fenestra bounded anteriorly by the premaxilla and posteriorly by the nasals; but *C. hoserae sp. nov.* and others in that species group are like *C. carinata* (with which they are sometimes sympatric) in having the intervestibular fenestra largely or entirely filled in by expansion of the premaxilla (derived from McDowell, 1979).

*Candoia hoserae sp. nov.* from the island of San Cristobal (AKA Makira) and nearby islets is separated from all other species within the *C. hoserae sp. nov.* species complex by the following unique suite of characters: A striped dorsal body pattern, being light brown with pair of lengthwise white dorsolateral stripes from over quadrate bone to near the tail-tip, the stripes edged with brown and a brown streak from angle of mouth almost to eye; the belly is buffy white; 235-257 ventrals, 18-22 maxillary teeth on either side of the mouth.

*Candoia louisemcgoldrickae sp. nov.* from the islands of Rennell and Bellona in the Solomon Islands is separated from all other species within the *C. hoserae sp. nov.* species complex by the following unique suite of characters: Similar in most respects to *C. hoserae sp. nov.* from which it can be separated from by the fact that the upper surface of the head is generally dark in colour and the generally dark head and the prominent thin, light temporal streak that runs to the neck is bounded by a distinctive white border at the margins. This taxon is also separated from *C. hoserae sp. nov.* by being of a generally blotched or broken



blotched dorsal pattern.

*Candoia simonmcgoldricki* sp. nov. from the Santa Cruz island group, including the nearby Reef Islands within the eastern Solomon Islands is separated from all other species within the *C. hoserae* sp. nov. species complex by the following unique suite of characters: Similar in most respects to *C. hoserae* sp. nov. and *C. louisemcgoldrickae* sp. nov. from which it can be separated from it by a profusion of black pigment on the dorsal snout tip and including the rostral and all of first labial on either side. There is a particularly thick dark postorbital stripe (as opposed to medium in *C. hoserae* sp. nov. and *C. louisemcgoldrickae* sp. nov.). 38-41 midbody scale rows in *C. simonmcgoldricki* sp. nov. versus 36-37 in *C. hoserae* sp. nov. and *Candoia louisemcgoldrickae* sp. nov..

The species *Candoia simonmcgoldricki* sp. nov. is further diagnosed and defined by the following: 15-21 infralabials, 250-266 ventrals versus 235-257 for *C. hoserae* sp. nov. and *Candoia louisemcgoldrickae* sp. nov., 61-64 subcaudals versus 54-63 subcaudals for *C. hoserae* sp. nov. and *Candoia louisemcgoldrickae* sp. nov., 18-22 maxillary teeth, hemipenis fully everted extending from 9-20 subcaudals.

The species *Candoia jamiekonstandinoui* sp. nov. from Vanuatu and the nearby Banks Islands, including nearby islets is separated from all other species within the *C. hoserae* sp. nov. species group by the following unique suite of characters: A distinctive dorsal colouration of pale reddish brown above with semidistinct markings, with a dark brown vertebral stripe edged with yellow; a uniform yellow beneath. Males are unique in the *C. bibrioni* species complex in that they have some noticeable dark pigmentation on the hemipenes. 16-18 maxillary teeth for the nominate subspecies, versus 19 in *C. jamiekonstandinoui georgekonstandinoui* subsp. nov..

The subspecies *C. jamiekonstandinoui jamiekonstandinoui* subsp. nov. has 234-247 ventrals, versus 222-225 ventrals in *C. jamiekonstandinoui georgekonstandinoui* subsp. nov..

*C. jamiekonstandinoui georgekonstandinoui* subsp. nov. has the lowest ventral counts of any named taxon within the *C. hoserae* sp. nov. species group.

*Candoia bibrioni* and other species described in this paper that were formerly treated as populations of *C. bibrioni* are herein defined as being the *C. bibrioni* species complex.

The *C. bibrioni* species group are those species not included in the *C. hoserae* sp. nov. species group, as defined elsewhere in this paper.

**Distribution:** The *Candoia hoserae* sp. nov. species group are found in the Solomon Islands, including San Cristobal (Makira), Rennell, Bellona, Ugi, Olu Malau, Santa Ana, Santa Cruz, Reef Islands, Vanikuro, Utupua as well as the Banks Islands and Vanuatu.

The southern boundary of the species distribution is the so-called Cheesman's Line as defined by Hamilton *et al.* (2010), which is a well-known faunal boundary for Pacific island fauna.

*C. simonmcgoldricki* sp. nov. is restricted to the Santa Cruz islands and nearby islands including the Reef Islands, Santa Ana, Vanikuro, Utupua and immediately adjacent islets.

**Etymology:** *C. simonmcgoldricki* sp. nov. is named in honour of Simon McGoldrick of Ringwood East, Melbourne, Victoria, Australia, for his contributions to wildlife conservation and education including through his work with Snakebusters: Australia's best reptiles shows.

#### **CANDOIA LOUISEMCGOLDRICKAE SP. NOV.**

**Holotype:** A specimen at the Field Museum of Natural History (FMNH), Chicago, Illinois, USA, specimen number: 71741 (FMNH Amphibians and Reptiles) from Bellona Island, Solomon Islands.

This facility allows access to its holdings by scientists.

**Paratype:** A specimen at the Field Museum of Natural History (FMNH), Chicago, Illinois, USA, specimen number: 71742

(FMNH Amphibians and Reptiles) from Bellona Island, Solomon Islands.

**Diagnosis:** *Candoia hoserae* sp. nov. and others in the *C. hoserae* sp. nov. species group including *C. louisemcgoldrickae* sp. nov. are defined as the three species from the Solomon Islands, including outliers, as well as the single species from the proximal Banks Islands and nearby New Hebrides, which is herein treated as two separate subspecies, being separated by deep water.

These taxa are *C. hoserae* sp. nov., *C. louisemcgoldrickae* sp. nov., *C. simonmcgoldricki* sp. nov. and *C. jamiekonstandinoui* sp. nov., the latter of which includes the subspecies *C. jamiekonstandinoui georgekonstandinoui* subsp. nov..

These species are all separated from *C. bibrioni* and others in the *C. bibrioni* species group (being all others in the *C. bibrioni* complex) as detailed in the preceding text, by the form of the postorbital bone, which has its ventral (free) end abruptly flexed backward, as in *C. carinata*, rather than forming a simple crescent arc as seen in the *C. bibrioni* species group. In the *C. bibrioni* species group the premaxilla has the "typical boine" form described by Frazzetta (1959, 1975), with a large fenestra between the narial vestibules, this fenestra bounded anteriorly by the premaxilla and posteriorly by the nasals; but *C. hoserae* sp. nov. and others in that species group are like *C. carinata* (with which they are sometimes sympatric) in having the intervestibular fenestra largely or entirely filled in by expansion of the premaxilla (derived from McDowell, 1979).

*Candoia hoserae* sp. nov. from the island of San Cristobal (AKA Makira) and nearby islets is separated from all other species within the *C. hoserae* sp. nov. species complex by the following unique suite of characters: A striped dorsal body pattern, being light brown with pair of lengthwise white dorsolateral stripes from over quadrate bone to near the tail-tip, the stripes edged with brown and a brown streak from angle of mouth almost to eye; the belly is buffy white; 235-257 ventrals, 18-22 maxillary teeth on either side of the mouth.

*Candoia louisemcgoldrickae* sp. nov. from the islands of Rennell and Bellona in the Solomon Islands is separated from all other species within the *C. hoserae* sp. nov. species complex by the following unique suite of characters: Similar in most respects to *C. hoserae* sp. nov. from which it can be separated from by the fact that the upper surface of the head is generally dark in colour, the generally dark head and the prominent thin, light temporal streak that runs to the neck is bounded by a distinctive white border at the margins. This taxon is also separated from *C. hoserae* sp. nov. by being of a generally blotched or broken blotched dorsal pattern.

*Candoia simonmcgoldricki* sp. nov. from the Santa Cruz island group, including the nearby Reef Islands within the eastern Solomon Islands is separated from all other species within the *C. hoserae* sp. nov. species complex by the following unique suite of characters: Similar in most respects to *C. hoserae* sp. nov. and *C. louisemcgoldrickae* sp. nov. from which it can be separated from it by a profusion of black pigment on the dorsal snout tip and including the rostral and all of first labial on either side. There is a particularly thick dark postorbital stripe (as opposed to medium in *C. hoserae* sp. nov. and *C. louisemcgoldrickae* sp. nov.). 38-41 midbody scale rows in *C. simonmcgoldricki* sp. nov. versus 36-37 in *C. hoserae* sp. nov. and *Candoia louisemcgoldrickae* sp. nov..

The species *Candoia simonmcgoldricki* sp. nov. is further diagnosed and defined by the following: 15-21 infralabials, 250-266 ventrals versus 235-257 for *C. hoserae* sp. nov. and *Candoia louisemcgoldrickae* sp. nov., 61-64 subcaudals versus 54-63 subcaudals for *C. hoserae* sp. nov. and *Candoia louisemcgoldrickae* sp. nov., 18-22 maxillary teeth, hemipenis fully everted extending from 9-20 subcaudals.

The species *Candoia jamiekonstandinoui* sp. nov. from Vanuatu and the nearby Banks Islands, including nearby islets is

separated from all other species within the *C. hoserae* sp. nov. species group by the following unique suite of characters: A distinctive dorsal colouration of pale reddish brown above with semidistinct markings, with a dark brown vertebral stripe edged with yellow; a uniform yellow beneath. Males are unique in the *C. bibrioni* species complex in that they have some noticeable dark pigmentation on the hemipenes. 16-18 maxillary teeth for the nominate subspecies, versus 19 in *C. jamiekonstandinoui georgekonstandinoui subsp. nov.*

The subspecies *C. jamiekonstandinoui jamiekonstandinoui subsp. nov.* has 234-247 ventrals, versus 222-225 ventrals in *C. jamiekonstandinoui georgekonstandinoui subsp. nov.*

*C. jamiekonstandinoui georgekonstandinoui subsp. nov.* has the lowest ventral counts of any named taxon within the *C. hoserae* sp. nov. species group.

*Candoia bibrioni* and other species described in this paper that were formerly treated as populations of *C. bibrioni* are herein defined as being the *C. bibrioni* species complex.

The *C. bibrioni* species group are those species not included in the *C. hoserae* sp. nov. species group, as defined elsewhere in this paper.

**Distribution:** *C. louisemcgoldrickae* sp. nov. is restricted to Rennell and Bellona and immediately adjacent islets in the south-east Solomon Islands.

The *Candoia hoserae* sp. nov. species group are found in the Solomon Islands, including San Cristobal (Makira), Rennell, Bellona, Ugi, Olu Malau, Santa Ana, Santa Cruz, Reef Islands, Vanikuro, Utupua as well as the Banks Islands and Vanuatu.

The southern boundary of the species distribution is the so-called Cheesman's Line as defined by Hamilton *et al.* (2010), which is a well-known faunal boundary for Pacific island fauna.

**Etymology:** *C. louisemcgoldrickae* sp. nov. is named in honour of Louise McGoldrick of Ringwood East, Melbourne, Victoria, Australia, for her contributions to wildlife conservation and education including through her work with Snakebusters: Australia's best reptiles shows over many years.

#### **CANDOIA JAMIEKONSTANDINOUI SP. NOV.**

**Holotype:** A female specimen at the American Museum of Natural History (AMNH), New York, USA, specimen number: 42004 collected at Malekula Island (Vanuatu), New Hebrides.

This is a facility that allows access to its holdings by scientists.

**Paratypes:** 1/ A female specimen at the American Museum of Natural History (AMNH), New York, USA, specimen number: 81584 collected at Malekula Island (Vanuatu), New Hebrides.

2/ A female specimen at the American Museum of Natural History (AMNH), New York, USA specimen number: 81583 collected at Espiritu Santo (Vanuatu), New Hebrides.

3/ A male specimen at the American Museum of Natural History (AMNH), New York, USA specimen number: 42075 collected at Espiritu Santo (Vanuatu), New Hebrides.

**Diagnosis:** *Candoia hoserae* sp. nov. and others in the *C. hoserae* sp. nov. species group are defined as the three species from the Solomon Islands, including outliers, as well as the single species from the Banks Islands and nearby New Hebrides, which is herein treated as two separate subspecies, separated by deep water.

These taxa are *C. hoserae* sp. nov., *C. louisemcgoldrickae* sp. nov., *C. simonmcgoldricki* sp. nov. and *C. jamiekonstandinoui* sp. nov., the latter of which includes the subspecies *C. jamiekonstandinoui georgekonstandinoui subsp. nov.*

These species are all separated from *C. bibrioni* and others in the *C. bibrioni* species group (being all others in the *C. bibrioni* complex) as detailed in the preceding text, by the form of the postorbital bone, which has its ventral (free) end abruptly flexed backward, as in *C. carinata*, rather than forming a simple crescent arc as seen in the *C. bibrioni* species group. In the *C. bibrioni* species group the premaxilla has the "typical boine" form described by Frazzetta (1959, 1975), with a large fenestra

between the narial vestibules, this fenestra bounded anteriorly by the premaxilla and posteriorly by the nasals; but *C. hoserae* sp. nov. and others in that species group are like *C. carinata* (with which they are sometimes sympatric) in having the intervestibular fenestra largely or entirely filled in by expansion of the premaxilla (derived from McDowell, 1979).

*Candoia hoserae* sp. nov. from the island of San Cristobal (AKA Makira) and nearby islets is separated from all other species within the *C. hoserae* sp. nov. species complex by the following unique suite of characters: A striped dorsal body pattern, being light brown with pair of lengthwise white dorsolateral stripes from over quadrate bone to near the tail-tip, the stripes edged with brown and a brown streak from angle of mouth almost to eye; the belly is buffy white; 235-257 ventrals, 18-22 maxillary teeth on either side of the mouth.

*Candoia louisemcgoldrickae* sp. nov. from the islands of Rennell and Bellona in the Solomon Islands is separated from all other species within the *C. hoserae* sp. nov. species complex by the following unique suite of characters: Similar in most respects to *C. hoserae* sp. nov. from which it can be separated from by the fact that the upper surface of the head is generally dark in colour and the generally dark head and the prominent thin, light temporal streak that runs to the neck is bounded by a distinctive white border at the margins. This taxon is also separated from *C. hoserae* sp. nov. by being of a generally blotched or broken blotched dorsal pattern.

*Candoia simonmcgoldricki* sp. nov. from the Santa Cruz island group, including the nearby Reef Islands within the eastern Solomon Islands is separated from all other species within the *C. hoserae* sp. nov. species complex by the following unique suite of characters: Similar in most respects to *C. hoserae* sp. nov. and *C. louisemcgoldrickae* sp. nov. from which it can be separated from it by a profusion of black pigment on the dorsal snout tip and including the rostral and all of first labial on either side. There is a particularly thick dark postorbital stripe (as opposed to medium in *C. hoserae* sp. nov. and *C. louisemcgoldrickae* sp. nov.). 38-41 midbody scale rows in *C. simonmcgoldricki* sp. nov. versus 36-37 in *C. hoserae* sp. nov. and *Candoia louisemcgoldrickae* sp. nov.

The species *Candoia simonmcgoldricki* sp. nov. is further diagnosed and defined by the following: 15-21 infralabials, 250-266 ventrals versus 235-257 for *C. hoserae* sp. nov. and *Candoia louisemcgoldrickae* sp. nov., 61-64 subcaudals versus 54-63 subcaudals for *C. hoserae* sp. nov. and *Candoia louisemcgoldrickae* sp. nov., 18-22 maxillary teeth, hemipenis fully everted extending from 9-20 subcaudals.

The species *Candoia jamiekonstandinoui* sp. nov. from Vanuatu and the nearby Banks Islands, including nearby islets is separated from all other species within the *C. hoserae* sp. nov. species group by the following unique suite of characters: A distinctive dorsal colouration of pale reddish brown above with semidistinct markings, with a dark brown vertebral stripe edged with yellow; a uniform yellow beneath. Males are unique in the *C. bibrioni* species complex in that they have some noticeable dark pigmentation on the hemipenes. 16-18 maxillary teeth for the nominate subspecies, versus 19 in *C. jamiekonstandinoui georgekonstandinoui subsp. nov.*

The subspecies *C. jamiekonstandinoui jamiekonstandinoui subsp. nov.* has 234-247 ventrals, versus 222-225 ventrals in *C. jamiekonstandinoui georgekonstandinoui subsp. nov.*

*C. jamiekonstandinoui georgekonstandinoui subsp. nov.* has the lowest ventral counts of any named taxon within the *C. hoserae* sp. nov. species group.

*Candoia bibrioni* and other species described in this paper that were formerly treated as populations of *C. bibrioni* are herein defined as being the *C. bibrioni* species complex.

The *C. bibrioni* species group are those species not included in the *C. hoserae* sp. nov. species group, as defined elsewhere in this paper.

**Distribution:** The nominate form of *C. jamiekonstandinoui jamiekonstandinoui subsp. nov.* is found on the New Hebrides islands of Malekula, Espiritu Santo, Ambae (AKA Aoba), Malo and Maewo. The subspecies *C. jamiekonstandinoui georgekonstandinoui subsp. nov.* is found on the Banks Islands including Vanua Lava and presumably other major islands in the group.

**Etymology:** Named in honour of Jamie Christopher Konstandinoui of George's Park Orchards Service Centre in Ringwood, Victoria, Australia formerly of Park Orchards, Victoria, Australia, for vital logistical support to important herpetological scientific research projects for more than a decade.

**CANDOIA JAMIEKONSTANDINOUI GEORGEKONSTANDINOUI SUBSP. NOV.**

**Holotype:** A male specimen at the American Museum of Natural History (AMNH), New York, USA, specimen number: 81581 collected at Vanua Lava (Banks Islands), New Hebrides.

This is a facility that allows access to its holdings by scientists.

**Paratype:** A male specimen at the American Museum of Natural History (AMNH), New York, USA, specimen number: 81582 collected at Vanua Lava (Banks Islands), New Hebrides.

**Diagnosis:** *Candoia hoserae sp. nov.* and others in the *C. hoserae sp. nov.* species group are defined herein as the three species from the Solomon Islands, including outliers, as well as the single species from the Banks Islands and nearby northern and central New Hebrides, which is herein treated as two separate subspecies, separated by deep water.

These taxa are *C. hoserae sp. nov.*, *C. louisemgoldrickae sp. nov.*, *C. simonmcgoldricki sp. nov.* and *C. jamiekonstandinoui sp. nov.*, the latter of which includes the subspecies *C. jamiekonstandinoui georgekonstandinoui subsp. nov.*

These species are all separated from *C. bibrioni* and others in the *C. bibrioni* species group (being all others in the *C. bibrioni* complex) as detailed in the preceding text, by the form of the postorbital bone, which has its ventral (free) end abruptly flexed backward, as in *C. carinata*, rather than forming a simple crescent arc as seen in the *C. bibrioni* species group. In the *C. bibrioni* species group the premaxilla has the "typical boine" form described by Frazzetta (1959, 1975), with a large fenestra between the narial vestibules, this fenestra bounded anteriorly by the premaxilla and posteriorly by the nasals; but *C. hoserae sp. nov.* and others in that species group are like *C. carinata* (with which they are sometimes sympatric) in having the intervestibular fenestra largely or entirely filled in by expansion of the premaxilla (derived from McDowell, 1979).

*Candoia hoserae sp. nov.* from the island of San Cristobal (AKA Makira) and nearby islets is separated from all other species within the *C. hoserae sp. nov.* species complex by the following unique suite of characters: A striped dorsal body pattern, being light brown with pair of lengthwise white dorsolateral stripes from over quadrate bone to near the tail-tip, the stripes edged with brown and a brown streak from angle of mouth almost to eye; the belly is buffy white; 235-257 ventrals, 18-22 maxillary teeth on either side of the mouth.

*Candoia louisemgoldrickae sp. nov.* from the islands of Rennell and Bellona in the Solomon Islands is separated from all other species within the *C. hoserae sp. nov.* species complex by the following unique suite of characters: Similar in most respects to *C. hoserae sp. nov.* from which it can be separated from by the fact that the upper surface of the head is generally dark in colour and the generally dark head and the prominent thin, light temporal streak that runs to the neck is bounded by a distinctive white border at the margins. This taxon is also separated from *C. hoserae sp. nov.* by being of a generally blotched or broken blotched dorsal pattern.

*Candoia simonmcgoldricki sp. nov.* from the Santa Cruz island group, including the nearby Reef Islands within the eastern Solomon Islands is separated from all other species within the

*C. hoserae sp. nov.* species complex by the following unique suite of characters: Similar in most respects to *C. hoserae sp. nov.* and *C. louisemgoldrickae sp. nov.* from which it can be separated from it by a profusion of black pigment on the dorsal snout tip and including the rostral and all of first labial on either side. There is a particularly thick dark postorbital stripe (as opposed to medium in *C. hoserae sp. nov.* and *C. louisemgoldrickae sp. nov.*). 38-41 midbody scale rows in *C. simonmcgoldricki sp. nov.* versus 36-37 in *C. hoserae sp. nov.* and *Candoia louisemgoldrickae sp. nov.*

The species *Candoia simonmcgoldricki sp. nov.* is further diagnosed and defined by the following: 15-21 infralabials, 250-266 ventrals versus 235-257 for *C. hoserae sp. nov.* and *Candoia louisemgoldrickae sp. nov.*, 61-64 subcaudals versus 54-63 subcaudals for *C. hoserae sp. nov.* and *Candoia louisemgoldrickae sp. nov.*, 18-22 maxillary teeth, hemipenis fully everted extending from 9-20 subcaudals.

The species *Candoia jamiekonstandinoui sp. nov.* from Vanuatu and the nearby Banks Islands, including nearby islets is separated from all other species within the *C. hoserae sp. nov.* species group by the following unique suite of characters: A distinctive dorsal colouration of pale reddish brown above with semidistinct markings, with a dark brown vertebral stripe edged with yellow; a uniform yellow beneath. Males are unique in the *C. bibrioni* species complex in that they have some noticeable dark pigmentation on the hemipenes. 16-18 maxillary teeth for the nominate subspecies, versus 19 in *C. jamiekonstandinoui georgekonstandinoui subsp. nov.*

The subspecies *C. jamiekonstandinoui jamiekonstandinoui subsp. nov.* has 234-247 ventrals, versus 222-225 ventrals in *C. jamiekonstandinoui georgekonstandinoui subsp. nov.*

*C. jamiekonstandinoui georgekonstandinoui subsp. nov.* has the lowest ventral counts of any named taxon within the *C. hoserae sp. nov.* species group.

*Candoia bibrioni* and other species described in this paper that were formerly treated as populations of *C. bibrioni* are herein defined as being the *C. bibrioni* species complex.

The *C. bibrioni* species group are those species not included in the *C. hoserae sp. nov.* species group, as defined elsewhere in this paper.

**Distribution:** The nominate form of *C. jamiekonstandinoui jamiekonstandinoui subsp. nov.* is found on the New Hebrides islands of Malekula, Espiritu Santo, Ambae (AKA Aoba), Malo and Maewo. The subspecies *C. jamiekonstandinoui georgekonstandinoui subsp. nov.* as defined herein is found on the Banks Islands including Vanua Lava and presumably other major islands in the group.

**Etymology:** This Subspecies is named in honour of George Konstandinoui of George's Park Orchards Service Centre in Ringwood, Victoria, Australia formerly of Park Orchards, Victoria, Australia, for vital logistical support to significant herpetological scientific research projects and Snakebusters wildlife conservation displays for more than a decade.

**CANDOIA WOOLFI SP. NOV.**

**Holotype:** A male specimen at the Museum of Comparative Zoology, Harvard University, USA, specimen number MCZ Herp R-15020, from Lakeba (AKA Lakemba) Island in the Lau group of islands, Fiji Islands.

The Museum of Comparative Zoology, Harvard University, USA, is a facility that allows access to its holdings by scientists.

**Paratypes:** Two female specimens at the Museum of Comparative Zoology, Harvard University, USA, specimen numbers MCZ Herp R-15019 and MCZ Herp R-15021, from Lakeba (AKA Lakemba) Island in the Lau group of islands, Fiji Islands.

**Diagnosis:** *Candoia bibrioni* and other species described in this paper that were formerly treated as populations of *C. bibrioni* are herein defined as being the *C. bibrioni* species complex.

The *C. bibroni* species group are those species not included in the *C. hoserae* sp. nov. species group, as defined below or elsewhere in this paper.

All species within the *C. bibroni* species complex are separated from all other *Candoia* by having supralabials separated from the eye by the subocular scales, versus *C. carinata* (Schneider, 1801) and *C. paulsoni* (Stull, 1956) which have them entering the eye; preocular differentiated; canthus rostralis rounded; a relatively slender body with lengthwise ridges on the body scales that run parallel to the long axis of the body, versus a stout body with keels on the body scales forming oblique rows as in *C. aspera* (Günther, 1877); ventrals 203-266; subcaudals 44-67. Furthermore the tail more than twice as long as the head, being capable of more than one complete circle of coiling in the vertical plane.

The species *Candoia carinata* (Schneider, 1801) including species and subspecies formerly treated as being within this taxon (e.g. *C. paulsoni* Stull, 1956) is separated from the *C. bibroni* complex by having 2, or rarely 1 or 3 supralabials entering eye; an angulate canthus rostralis, 160-202 ventrals and 35-60 subcaudals.

The species *Candoia aspera* (Günther, 1877) including species and subspecies formerly treated as being within this taxon is separated from the *C. bibroni* complex by having a tail less than twice as long as the head, usually being shorter than the head; is incapable of forming a full circle of coiling in vertical plane; at least on the anterior two-thirds of body are keels of scales forming curved diagonal ridges along the sides, which extend backward and downward towards the belly; 127-153 ventrals; 11-22 subcaudals; no specially enlarged preocular; (supralabials excluded from the eye; canthus rostralis angular).

*Candoia hoserae* sp. nov. and others in the *C. hoserae* sp. nov. species group are defined as the three species from the Solomon Islands, including outliers, as well as the single species from the Banks Islands and nearby New Hebrides.

These species which are defined in detail already in this paper, are all separated from *C. bibroni* and others in the *C. bibroni* species group (being all others in the *C. bibroni* complex) by the form of the postorbital bone, which has its ventral (free) end abruptly flexed backward, as in *C. carinata*, rather than forming a simple crescent arc as seen in *C. bibroni*. In *C. bibroni* the premaxilla has the "typical boine" form described by Frazzetta (1959, 1975), with a large fenestra between the narial vestibules, this fenestra bounded anteriorly by the premaxilla and posteriorly by the nasals; but *C. hoserae* sp. nov. and others in the species group are like *C. carinata* (with which they are sometimes sympatric) in having the intervestibular fenestra largely or entirely filled in by expansion of the premaxilla.

*Candoia bibroni* (Hombron and Jacquinet, 1853) *sensu stricto* as defined in this paper, is the taxon from the main Fiji islands including Viti Levu and Vanua Levu and immediately adjacent islands, but not including Kadavu or the islands in the Lau group, each of which has a different species.

The taxon *C. bibroni* is separated from all other species within the *C. bibroni* species complex by the following suite of characters: A blotched dorsal pattern with distinctive throat stripes and a low ventral count ranging from 207-227 ventrals.

The species *C. bibroni* is further defined by the following suite of characters: 18-22 Maxillary teeth, (versus 17-19 in *C. woolfi* sp. nov. from the Lau Group of islands), 53-59 subcaudals (versus 45-56 in *C. woolfi* sp. nov. from the Lau Group of islands), 10-16 supralabials, 12-17 infralabials, 26-30 scale rows behind the head at one head length behind the head (versus 33-34 in *C. woolfi* sp. nov.), 30-37 midbody rows, 19-24 scale rows one headlength anterior to the cloaca, hemipenis forks at subcaudal 6-10.

The species *Candoia woolfi* sp. nov. from the Lau Group of islands, east of the main Fiji islands is separated from all other species within the *C. bibroni* species complex by the following

suite of characters: A blotched pattern without stripes. The tail pattern is much more conspicuous than that of body, the pale bordering of body blotches also replacing darker ground color on the tail; 205-236 ventrals; there are 33-34 scale rows behind the head at one head length behind the head (versus 26-30 in *C. bibroni*).

The species *Candoia kimmooreae* sp. nov. from the island of Kadavu, southern Fiji is separated from all other species within the *C. bibroni* species complex by having a blotched pattern which includes a prominent median throat stripe and no lateral throat stripes. Otherwise this taxon is essentially similar in form to nominate *C. bibroni*.

The species *Candoia malcolmmaclurei* sp. nov. from the Loyalty Islands, (territory controlled by New Caledonia) is separated from all other species within the *C. bibroni* species complex by having a blotched pattern without stripes and a tail similar in pattern to the body, or alternatively a blotched pattern with throat stripes including a median row of dark spots on anterior ventrals; dark perocular streak from angle of mouth (or angle of jaw) through eye to loreal region, dark spots on lips, and dark spotting on top of head and with a median ventral row of dark spots. Sometimes the colouration is dulled to appear unicolour. The species is further defined by having 13-16 infralabials, 27-30 scale rows on the neck at one head length back, 20-22 scale rows at one headlength anterior to the cloaca, 219-226 ventrals, 53-60 subcaudals and 19-22 maxillary teeth on either side.

The species *Candoia boutrosi* sp. nov. from the islands of Samoa is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: a distinctive blotched dorsal body pattern that is one or other of being distinct or very indistinct, the large dark blotches being the main component of the dorsal midline for the anterior and mid-body, with the lighter blotches dominating the midline posteriorly, reversing on the tail to have the darker blotches dominate on the tail, which remains brightly marked for the whole length. The dorsal colouration is a combination of chocolate brown and beige in distinctly marked animals or a hybrid of this in the indistinctly marked animals. On the head is a well-defined creamish bar on the upper labials above the jawline.

It is also defined as having 12 supralabials bilaterally (in common with the three species from the Fiji Islands), 15-16 infralabials (as for *C. bibroni sensu stricto*), and 31-32 scale rows on the neck, one head length back from the head (versus 26-30 in *C. bibroni sensu stricto*).

*C. boutrosi* sp. nov. is further defined and separated from the other species in the *C. bibroni* complex by the following suite of characters 37-38 mid-body rows, 22-24 scale rows at one head length anterior to the cloaca, 237-252 ventrals, 51-61 subcaudals and 16-18 maxillary teeth on either side.

The species *Candoia niraikanukiwai* sp. nov. from the islands of Wallis and Futuna, including nearby islets is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: It is essentially similar in most respects to *C. boutrosi* sp. nov. from which it differs by having a distinctive well-defined stripe running through the eye on either side of the head and the absence of a well-defined creamish bar on the upper labials above the jawline.

The species *Candoia georgemacintyrei* sp. nov. from the island of Rotuma, is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: 235-240 ventrals, 57-63 subcaudals, 37-39 mid body rows and significant lightening of the upper labials; the dorsal pattern is blotched and semi-distinct and there is significant speckling and markings on the venter.

**Distribution:** *C. woolfi* sp. nov. is found in the Lau Group of islands, east of the main Fiji islands, in a region generally south of the deep water Nanuku Passage and east of the Koro Sea. The taxon is found on most of the larger islands in the group including Vanua Mbelavu, Lakemba, Ongea Levu and Fulanga.

**Etymology:** Named in honour of Paul Woolf, of Walloon, Queensland, Australia in recognition of contributions to herpetology spanning three decades, including in his role as foundation president of the Herpetological Society of Queensland Incorporated, HSQI, and management roles in the society ever since, as well his defence of herpetology from illegal acts of taxonomic vandalism by the likes of convicted criminal David John Williams and associates in crime, Wolfgang Wüster, Mark O'Shea, Wulf Schleip, Scott Thomson, Van Wallach, George Zug, Anders Rhodin and Hinrich Kaiser.

**CANDOIA KIMMOOREAE SP. NOV.**

**Holotype:** A preserved specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R.135213 collected at Nakasaleka in the north of Kadavu Island, Fiji (18°57'S, 178°23'E).

This is a government owned facility that allows access to its holdings.

**Paratypes:** Two preserved specimens at the Australian Museum, Sydney, NSW, Australia, specimen numbers: R.135212 and R.135214 collected at Nakasaleka in the north of Kadavu Island, Fiji (18°57'S, 178°23'E).

**Diagnosis:** *Candoia bibrioni* and other species described in this paper that were formerly treated as populations of *C. bibrioni* are herein defined as being the *C. bibrioni* species complex.

The *C. bibrioni* species group are those species not included in the *C. hoserae* sp. nov. species group, as defined below.

All species within the *C. bibrioni* species complex are separated from all other *Candoia* by having supralabials separated from the eye by the subocular scales, versus *C. carinata* (Schneider, 1801) and *C. paulsoni* (Stull, 1956) which have them entering the eye; preocular differentiated; canthus rostralis rounded; a relatively slender body with lengthwise ridges on the body scales that run parallel to the long axis of the body, versus a stout body with keels on the body scales forming oblique rows as in *C. aspera* (Günther, 1877); ventrals 203-266; subcaudals 44-67. Furthermore the tail more than twice as long as the head, being capable of more than one complete circle of coiling in the vertical plane.

The species *Candoia carinata* (Schneider, 1801) including species and subspecies formerly treated as being within this taxon (e.g. *C. paulsoni* Stull, 1956) is separated from the *C. bibrioni* complex by having 2, or rarely 1 or 3 supralabials entering eye; an angulate canthus rostralis, 160-202 ventrals and 35-60 subcaudals.

The species *Candoia aspera* (Günther, 1877) including species and subspecies formerly treated as being within this taxon is separated from the *C. bibrioni* complex by having a tail less than twice as long as the head, usually being shorter than the head; is incapable of forming a full circle of coiling in vertical plane; at least on the anterior two-thirds of body are keels of scales forming curved diagonal ridges along the sides, which extend backward and downward towards the belly; 127-153 ventrals; 11-22 subcaudals; no specially enlarged preocular; supralabials excluded from the eye; canthus rostralis angular.

*Candoia hoserae* sp. nov. and others in the *C. hoserae* sp. nov. species group are defined as the three species from the Solomon Islands, including outliers, as well as the single species from the Banks Islands and nearby New Hebrides.

These species which are defined in detail already in this paper, are all separated from *C. bibrioni* and others in the *C. bibrioni* species group (being all others in the *C. bibrioni* complex) by the form of the postorbital bone, which has its ventral (free) end abruptly flexed backward, as in *C. carinata*, rather than forming a simple crescent arc as seen in *C. bibrioni*. In *C. bibrioni* the premaxilla has the "typical boine" form described by Frazzetta (1959, 1975), with a large fenestra between the narial vestibules, this fenestra bounded anteriorly by the premaxilla and posteriorly by the nasals; but *C. hoserae* sp. nov. and others in the species group are like *C. carinata* (with which they are sometimes

sympatric) in having the intervestibular fenestra largely or entirely filled in by expansion of the premaxilla.

*Candoia bibrioni* (Hombron and Jacquinot, 1853) *sensu stricto* as defined in this paper, is the taxon from the main Fiji islands including Viti Levu and Vanua Levu and immediately adjacent islands, but not including Kadavu or the islands in the Lau group, each of which has a different species.

The taxon *C. bibrioni* is separated from all other species within the *C. bibrioni* species complex by the following suite of characters: A blotched dorsal pattern with distinctive throat stripes and a low ventral count ranging from 207-227 ventrals.

The species *C. bibrioni* is further defined by the following suite of characters: 18-22 Maxillary teeth, (versus 17-19 in *C. woolfi* sp. nov. from the Lau Group of islands), 53-59 subcaudals (versus 45-56 in *C. woolfi* sp. nov. from the Lau Group of islands), 10-16 supralabials, 12-17 infralabials, 26-30 scale rows behind the head at one head length behind the head (versus 33-34 in *C. woolfi* sp. nov.), 30-37 midbody rows, 19-24 scale rows one headlength anterior to the cloaca, hemipenis forks at subcaudal 6-10.

The species *Candoia woolfi* sp. nov. from the Lau Group of islands, east of the main Fiji islands is separated from all other species within the *C. bibrioni* species complex by the following suite of characters: A blotched pattern without stripes. The tail pattern is much more conspicuous than that of body, the pale bordering of body blotches also replacing darker ground color on the tail; 205-236 ventrals; there are 33-34 scale rows behind the head at one head length behind the head (versus 26-30 in *C. bibrioni*).

The species *Candoia kimmooreae* sp. nov. from the island of Kadavu, southern Fiji is separated from all other species within the *C. bibrioni* species complex by having a blotched pattern which includes a prominent median throat stripe and no lateral throat stripes. Otherwise this taxon is essentially similar in form to nominate *C. bibrioni* as described herein.

The species *Candoia malcolmmaclurei* sp. nov. from the Loyalty Islands, (territory controlled by New Caledonia) is separated from all other species within the *C. bibrioni* species complex by having a blotched pattern without stripes and a tail similar in pattern to the body, or alternatively a blotched pattern with throat stripes including a median row of dark spots on anterior ventrals; dark perocular streak from angle of mouth (or angle of jaw) through eye to loreal region, dark spots on lips, and dark spotting on top of head and with a median ventral row of dark spots. Sometimes the colouration is dulled to appear unicolour. The species is further defined by having 13-16 infralabials, 27-30 scale rows on the neck at one head length back, 20-22 scale rows at one headlength anterior to the cloaca, 219-226 ventrals, 53-60 subcaudals and 19-22 maxillary teeth on either side.

The species *Candoia boutrosi* sp. nov. from the islands of Samoa is separated from all other species within the *C. bibrioni* species complex by the following unique suite of characters: a distinctive blotched dorsal body pattern that is one or other of being distinct or very indistinct, the large dark blotches being the main component of the dorsal midline for the anterior and mid-body, with the lighter blotches dominating the midline posteriorly, reversing on the tail to have the darker blotches dominate on the tail, which remains brightly marked for the whole length. The dorsal colouration is a combination of chocolate brown and beige in distinctly marked animals or a hybrid of this in the indistinctly marked animals. On the head is a well-defined creamish bar on the upper labials above the jawline.

It is also defined as having 12 supralabials bilaterally (in common with the three species from the Fiji Islands), 15-16 infralabials (as for *C. bibrioni sensu stricto*), and 31-32 scale rows on the neck, one head length back from the head (versus 26-30 in *C. bibrioni sensu stricto*).

*C. boutrosi* sp. nov. is further defined and separated from the other species in the *C. bibrioni* complex by the following suite of

characters 37-38 mid-body rows, 22-24 scale rows at one head length anterior to the cloaca, 237-252 ventrals, 51-61 subcaudals and 16-18 maxillary teeth on either side.

The species *Candoia niraikanukiwai* sp. nov. from the islands of Wallis and Futuna, including nearby islets is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: It is essentially similar in most respects to *C. boutrosi* sp. nov. from which it differs by having a distinctive well-defined stripe running through the eye on either side of the head and the absence of a well-defined creamish bar on the upper labials above the jawline.

The species *Candoia georgemacintyreii* sp. nov. from the island of Rotuma, is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: 235-240 ventrals, 57-63 subcaudals, 37-39 mid body rows and significant lightening of the upper labials; the dorsal pattern is blotched and semi-distinct and there is significant speckling and markings on the venter.

**Distribution:** The islands of Kadavu and Ono in southern Fiji, in a region generally bounded by the deep water Kadavu Passage in the north and the Great Astrolabe Reef to the east.

**Etymology:** Named in honour of Kim Moore of Brisbane, Queensland, Australia, widow of Michael Moore (Pike), for her services to herpetology, including in association with the Herpetological Society of Queensland Incorporated, over some decades.

#### **CANDOIA MALCOLMMLUREI SP. NOV.**

**Holotype:** A preserved female specimen at the American Museum of Natural History, New York, USA, specimen number: AMNH 60468 from Mare Island in the Loyalty Islands, (territory of New Caledonia).

This is a facility that allows access to its holdings.

**Paratypes:** Two preserved female specimens at the American Museum of Natural History, New York, USA, specimen numbers: AMNH 61681 and AMNH 61682 from Ouvea Island in the Loyalty Islands, (territory of New Caledonia), as well as a male, specimen number: AMNH 61711 from the same place.

**Diagnosis:** *Candoia bibroni* and other species described in this paper that were formerly treated as populations of *C. bibroni* are herein defined as being the *C. bibroni* species complex.

The *C. bibroni* species group are those species not included in the *C. hoserai* sp. nov. species group, as defined below.

All species within the *C. bibroni* species complex are separated from all other *Candoia* by having supralabials separated from the eye by the subocular scales, versus *C. carinata* (Schneider, 1801) and *C. paulsoni* (Stull, 1956) which have them entering the eye; preocular differentiated; canthus rostralis rounded; a relatively slender body with lengthwise ridges on the body scales that run parallel to the long axis of the body, versus a stout body with keels on the body scales forming oblique rows as in *C. aspera* (Günther, 1877); ventrals 203-266; subcaudals 44-67. Furthermore the tail more than twice as long as the head, being capable of more than one complete circle of coiling in the vertical plane.

The species *Candoia carinata* (Schneider, 1801) including species and subspecies formerly treated as being within this taxon (e.g. *C. paulsoni* Stull, 1956) is separated from the *C. bibroni* complex by having 2, or rarely 1 or 3 supralabials entering eye; an angulate canthus rostralis, 160-202 ventrals and 35-60 subcaudals.

The species *Candoia aspera* (Günther, 1877) including species and subspecies formerly treated as being within this taxon is separated from the *C. bibroni* complex by having a tail less than twice as long as the head, usually being shorter than the head; is incapable of forming a full circle of coiling in vertical plane; at least on the anterior two-thirds of body are keels of scales forming curved diagonal ridges along the sides, which extend backward and downward towards the belly; 127-153 ventrals; 11-

22 subcaudals; no specially enlarged preocular; (supralabials excluded from the eye; canthus rostralis angular).

*Candoia hoserai* sp. nov. and others in the *C. hoserai* sp. nov. species group are defined as the three species from the Solomon Islands, including outliers, as well as the single species from the Banks Islands and nearby New Hebrides.

These species which are defined in detail already in this paper, are all separated from *C. bibroni* and others in the *C. bibroni* species group (being all others in the *C. bibroni* complex) by the form of the postorbital bone, which has its ventral (free) end abruptly flexed backward, as in *C. carinata*, rather than forming a simple crescent arc as seen in *C. bibroni*. In *C. bibroni* the premaxilla has the "typical boine" form described by Frazzetta (1959, 1975), with a large fenestra between the narial vestibules, this fenestra bounded anteriorly by the premaxilla and posteriorly by the nasals; but *C. hoserai* sp. nov. and others in the species group are like *C. carinata* (with which they are sometimes sympatric) in having the intervestibular fenestra largely or entirely filled in by expansion of the premaxilla.

*Candoia bibroni* (Hombron and Jacquinot, 1853) *sensu stricto* as defined in this paper, is the taxon from the main Fiji islands including Viti Levu and Vanua Levu and immediately adjacent islands, but not including Kadavu or the islands in the Lau group, each of which has a different species.

The taxon *C. bibroni* is separated from all other species within the *C. bibroni* species complex by the following suite of characters: A blotched dorsal pattern with distinctive throat stripes and a low ventral count ranging from 207-227 ventrals.

The species *C. bibroni* is further defined by the following suite of characters: 18-22 Maxillary teeth, (versus 17-19 in *C. woolfi* sp. nov. from the Lau Group of islands), 53-59 subcaudals (versus 45-56 in *C. woolfi* sp. nov. from the Lau Group of islands), 10-16 supralabials, 12-17 infralabials, 26-30 scale rows behind the head at one head length behind the head (versus 33-34 in *C. woolfi* sp. nov.), 30-37 midbody rows, 19-24 scale rows one headlength anterior to the cloaca, hemipenis forks at subcaudal 6-10.

The species *Candoia woolfi* sp. nov. from the Lau Group of islands, east of the main Fiji islands is separated from all other species within the *C. bibroni* species complex by the following suite of characters: A blotched pattern without stripes. The tail pattern is much more conspicuous than that of body, the pale bordering of body blotches also replacing darker ground color on the tail; 205-236 ventrals; there are 33-34 scale rows behind the head at one head length behind the head (versus 26-30 in *C. bibroni*).

The species *Candoia kimmooreae* sp. nov. from the island of Kadavu, southern Fiji is separated from all other species within the *C. bibroni* species complex by having a blotched pattern which includes a prominent median throat stripe and no lateral throat stripes. Otherwise this taxon is essentially similar in form to nominate *C. bibroni* as described herein.

The species *Candoia malcolmmaclurei* sp. nov. from the Loyalty Islands, (territory controlled by New Caledonia) is separated from all other species within the *C. bibroni* species complex by having a blotched pattern without stripes and a tail similar in pattern to the body, or alternatively a blotched pattern with throat stripes including a median row of dark spots on anterior ventrals; dark perocular streak from angle of mouth (or angle of jaw) through eye to loreal region, dark spots on lips, and dark spotting on top of head and with a median ventral row of dark spots. Sometimes the colouration is dulled to appear unicolour. The species is further defined by having 13-16 infralabials, 27-30 scale rows on the neck at one head length back, 20-22 scale rows at one headlength anterior to the cloaca, 219-226 ventrals, 53-60 subcaudals and 19-22 maxillary teeth on either side.

The species *Candoia boutrosi* sp. nov. from the islands of Samoa is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: a

distinctive blotched dorsal body pattern that is one or other of being distinct or very indistinct, the large dark blotches being the main component of the dorsal midline for the anterior and mid-body, with the lighter blotches dominating the midline posteriorly, reversing on the tail to have the darker blotches dominate on the tail, which remains brightly marked for the whole length. The dorsal colouration is a combination of chocolate brown and beige in distinctly marked animals or a hybrid of this in the indistinctly marked animals. On the head is a well-defined creamish bar on the upper labials above the jawline.

It is also defined as having 12 supralabials bilaterally (in common with the three species from the Fiji Islands), 15-16 infralabials (as for *C. bibroni sensu stricto*), and 31-32 scale rows on the neck, one head length back from the head (versus 26-30 in *C. bibroni sensu stricto*).

*C. boutrosi* sp. nov. is further defined and separated from the other species in the *C. bibroni* complex by the following suite of characters 37-38 mid-body rows, 22-24 scale rows at one head length anterior to the cloaca, 237-252 ventrals, 51-61 subcaudals and 16-18 maxillary teeth on either side.

The species *Candoia niraikanukiwai* sp. nov. from the islands of Wallis and Futuna, including nearby islets is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: It is essentially similar in most respects to *C. boutrosi* sp. nov. from which it differs by having a distinctive well-defined stripe running through the eye on either side of the head and the absence of a well-defined creamish bar on the upper labials above the jawline.

The species *Candoia georgemacintyre* sp. nov. from the island of Rotuma, is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: 235-240 ventrals, 57-63 subcaudals, 37-39 mid body rows and significant lightening of the upper labials; the dorsal pattern is blotched and semi-distinct and there is significant speckling and markings on the venter.

**Distribution:** *C. malcolmmclurei* sp. nov. is known only from the Loyalty Islands of Ouvea, Lifou and Mare.

**Etymology:** Named in honour of Malcolm McLure of near Yea, Victoria, Australia, formerly of Elwood, Victoria, Australia, in recognition of his many public interest contributions to Australia, including his battles against illegally imposed road tolls in Australia, via his organisation UPMART, political corruption in Australia, including by exposing tax-evading corporations avoiding prosecution as a result of corrupt and illegal cash donations to politicians.

#### **CANDOIA BOUTROSI SP. NOV.**

**Holotype:** A preserved male specimen at the American Museum of Natural History, New York, USA, specimen number: AMNH 41742 collected on the island of Savaii, Western Samoa. This is a facility that allows access to its holdings.

**Paratype:** A preserved female specimen at the American Museum of Natural History, New York, USA, specimen number: AMNH 41743 collected at the island of Savaii, Western Samoa.

**Diagnosis:** *Candoia bibroni* and other species described in this paper that were formerly treated as populations of *C. bibroni* are herein defined as being the *C. bibroni* species complex.

The *C. bibroni* species group are those species not included in the *C. hoserae* sp. nov. species group, as defined below.

All species within the *C. bibroni* species complex are separated from all other *Candoia* by having supralabials separated from the eye by the subocular scales, versus *C. carinata* (Schneider, 1801) and *C. paulsoni* (Stull, 1956) which have them entering the eye; preocular differentiated; canthus rostralis rounded; a relatively slender body with lengthwise ridges on the body scales that run parallel to the long axis of the body, versus a stout body with keels on the body scales forming oblique rows as in *C. aspera* (Günther, 1877); ventrals 203-266; subcaudals 44-67. Furthermore the tail more than twice as long as the head, being

capable of more than one complete circle of coiling in the vertical plane.

The species *Candoia carinata* (Schneider, 1801) including species and subspecies formerly treated as being within this taxon (e.g. *C. paulsoni* Stull, 1956) is separated from the *C. bibroni* complex by having 2, or rarely 1 or 3 supralabials entering eye; an angulate canthus rostralis, 160-202 ventrals and 35-60 subcaudals.

The species *Candoia aspera* (Günther, 1877) including species and subspecies formerly treated as being within this taxon is separated from the *C. bibroni* complex by having a tail less than twice as long as the head, usually being shorter than the head; is incapable of forming a full circle of coiling in vertical plane; at least on the anterior two-thirds of body are keels of scales forming curved diagonal ridges along the sides, which extend backward and downward towards the belly; 127-153 ventrals; 11-22 subcaudals; no specially enlarged preocular; (supralabials excluded from the eye; canthus rostralis angular).

*Candoia hoserae* sp. nov. and others in the *C. hoserae* sp. nov. species group are defined as the three species from the Solomon Islands, including outliers, as well as the single species from the Banks Islands and nearby New Hebrides.

These species which are defined in detail already in this paper, are all separated from *C. bibroni* and others in the *C. bibroni* species group (being all others in the *C. bibroni* complex) by the form of the postorbital bone, which has its ventral (free) end abruptly flexed backward, as in *C. carinata*, rather than forming a simple crescent arc as seen in *C. bibroni*. In *C. bibroni* the premaxilla has the "typical boine" form described by Frazzetta (1959, 1975), with a large fenestra between the narial vestibules, this fenestra bounded anteriorly by the premaxilla and posteriorly by the nasals; but *C. hoserae* sp. nov. and others in the species group are like *C. carinata* (with which they are sometimes sympatric) in having the intervestibular fenestra largely or entirely filled in by expansion of the premaxilla.

*Candoia bibroni* (Hombron and Jacquinot, 1853) *sensu stricto* as defined in this paper, is the taxon from the main Fiji islands including Viti Levu and Vanua Levu and immediately adjacent islands, but not including Kadavu or the islands in the Lau group, each of which has a different species.

The taxon *C. bibroni* is separated from all other species within the *C. bibroni* species complex by the following suite of characters: A blotched dorsal pattern with distinctive throat stripes and a low ventral count ranging from 207-227 ventrals.

The species *C. bibroni* is further defined by the following suite of characters: 18-22 Maxillary teeth, (versus 17-19 in *C. woolfi* sp. nov. from the Lau Group of islands), 53-59 subcaudals (versus 45-56 in *C. woolfi* sp. nov. from the Lau Group of islands), 10-16 supralabials, 12-17 infralabials, 26-30 scale rows behind the head at one head length behind the head (versus 33-34 in *C. woolfi* sp. nov.), 30-37 midbody rows, 19-24 scale rows one headlength anterior to the cloaca, hemipenis forks at subcaudal 6-10.

The species *Candoia woolfi* sp. nov. from the Lau Group of islands, east of the main Fiji islands is separated from all other species within the *C. bibroni* species complex by the following suite of characters: A blotched pattern without stripes. The tail pattern is much more conspicuous than that of body, the pale bordering of body blotches also replacing darker ground color on the tail; 205-236 ventrals; there are 33-34 scale rows behind the head at one head length behind the head (versus 26-30 in *C. bibroni*).

The species *Candoia kimmooreae* sp. nov. from the island of Kadavu, southern Fiji is separated from all other species within the *C. bibroni* species complex by having a blotched pattern which includes a prominent median throat stripe and no lateral throat stripes. Otherwise this taxon is essentially similar in form to nominate *C. bibroni* as described herein.

The species *Candoia malcolmmclurei* sp. nov. from the Loyalty

Islands, (territory controlled by New Caledonia) is separated from all other species within the *C. bibroni* species complex by having a blotched pattern without stripes and a tail similar in pattern to the body, or alternatively a blotched pattern with throat stripes including a median row of dark spots on anterior ventrals; dark perocular streak from angle of mouth (or angle of jaw) through eye to loreal region, dark spots on lips, and dark spotting on top of head and with a median ventral row of dark spots. Sometimes the colouration is dulled to appear unicolour. The species is further defined by having 13-16 infralabials, 27-30 scale rows on the neck at one head length back, 20-22 scale rows at one headlength anterior to the cloaca, 219-226 ventrals, 53-60 subcaudals and 19-22 maxillary teeth on either side.

The species *Candoia boutrosi* sp. nov. from the islands of Samoa is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: a distinctive blotched dorsal body pattern that is one or other of being distinct or very indistinct, the large dark blotches being the main component of the dorsal midline for the anterior and mid-body, with the lighter blotches dominating the midline posteriorly, reversing on the tail to have the darker blotches dominate on the tail, which remains brightly marked for the whole length. The dorsal colouration is a combination of chocolate brown and beige in distinctly marked animals or a hybrid of this in the indistinctly marked animals. On the head is a well-defined creamish bar on the upper labials above the jawline.

It is also defined as having 12 supralabials bilaterally (in common with the three species from the Fiji Islands), 15-16 infralabials (as for *C. bibroni sensu stricto*), and 31-32 scale rows on the neck, one head length back from the head (versus 26-30 in *C. bibroni sensu stricto*).

*C. boutrosi* sp. nov. is further defined and separated from the other species in the *C. bibroni* complex by the following suite of characters 37-38 mid-body rows, 22-24 scale rows at one head length anterior to the cloaca, 237-252 ventrals, 51-61 subcaudals and 16-18 maxillary teeth on either side.

The species *Candoia niraikanukiwai* sp. nov. from the islands of Wallis and Futuna, including nearby islets is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: It is essentially similar in most respects to *C. boutrosi* sp. nov. from which it differs by having a distinctive well-defined stripe running through the eye on either side of the head and the absence of a well-defined creamish bar on the upper labials above the jawline.

The species *Candoia georgemacintyreii* sp. nov. from the island of Rotuma, is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: 235-240 ventrals, 57-63 subcaudals, 37-39 mid body rows and significant lightening of the upper labials; the dorsal pattern is blotched and semi-distinct and there is significant speckling and markings on the venter.

**Distribution:** *C. boutrosi* sp. nov. is known only from the islands of Samoa.

**Etymology:** Named in honour of Steve Boutros, from Templestowe, Victoria, Australia in recognition of his many contributions to the administration of justice via the legal system in Australia and other public benefit activities.

#### **CANDOIA NIRAIKANUKIWAI SP. NOV.**

**Holotype:** A preserved adult specimen at the French National Museum of Natural History, known in French as the Muséum national d'histoire naturelle, in Paris, France, specimen number: MNHN 1986.690, collected at Point Vele, Futuna, within the territory of Wallis and Futuna.

This is a facility that allows access to its holdings.

**Paratype:** A preserved specimen at the French National Museum of Natural History, known in French as the Muséum national d'histoire naturelle, in Paris, France, specimen number: MNHN RA 1993.228, collected on the island of Alafi, within the territory of Wallis and Futuna.

**Diagnosis:** *Candoia bibroni* and other species described in this paper that were formerly treated as populations of *C. bibroni* are herein defined as being the *C. bibroni* species complex.

The *C. bibroni* species group are those species not included in the *C. hoserae* sp. nov. species group, as defined below.

All species within the *C. bibroni* species complex are separated from all other *Candoia* by having supralabials separated from the eye by the subocular scales, versus *C. carinata* (Schneider, 1801) and *C. paulsoni* (Stull, 1956) which have them entering the eye; preocular differentiated; canthus rostralis rounded; a relatively slender body with lengthwise ridges on the body scales that run parallel to the long axis of the body, versus a stout body with keels on the body scales forming oblique rows as in *C. aspera* (Günther, 1877); ventrals 203-266; subcaudals 44-67. Furthermore the tail more than twice as long as the head, being capable of more than one complete circle of coiling in the vertical plane.

The species *Candoia carinata* (Schneider, 1801) including species and subspecies formerly treated as being within this taxon (e.g. *C. paulsoni* Stull, 1956) is separated from the *C. bibroni* complex by having 2, or rarely 1 or 3 supralabials entering eye; an angulate canthus rostralis, 160-202 ventrals and 35-60 subcaudals.

The species *Candoia aspera* (Günther, 1877) including species and subspecies formerly treated as being within this taxon is separated from the *C. bibroni* complex by having a tail less than twice as long as the head, usually being shorter than the head; is incapable of forming a full circle of coiling in vertical plane; at least on the anterior two-thirds of body are keels of scales forming curved diagonal ridges along the sides, which extend backward and downward towards the belly; 127-153 ventrals; 11-22 subcaudals; no specially enlarged preocular; (supralabials excluded from the eye; canthus rostralis angular).

*Candoia hoserae* sp. nov. and others in the *C. hoserae* sp. nov. species group are defined as the three species from the Solomon Islands, including outliers, as well as the single species from the Banks Islands and nearby New Hebrides.

These species which are defined in detail already in this paper, are all separated from *C. bibroni* and others in the *C. bibroni* species group (being all others in the *C. bibroni* complex) by the form of the postorbital bone, which has its ventral (free) end abruptly flexed backward, as in *C. carinata*, rather than forming a simple crescent arc as seen in *C. bibroni*. In *C. bibroni* the premaxilla has the "typical boine" form described by Frazzetta (1959, 1975), with a large fenestra between the narial vestibules, this fenestra bounded anteriorly by the premaxilla and posteriorly by the nasals; but *C. hoserae* sp. nov. and others in the species group are like *C. carinata* (with which they are sometimes sympatric) in having the intervestibular fenestra largely or entirely filled in by expansion of the premaxilla.

*Candoia bibroni* (Hombron and Jacquinot, 1853) *sensu stricto* as defined in this paper, is the taxon from the main Fiji islands including Viti Levu and Vanua Levu and immediately adjacent islands, but not including Kadavu or the islands in the Lau group, each of which has a different species.

The taxon *C. bibroni* is separated from all other species within the *C. bibroni* species complex by the following suite of characters: A blotched dorsal pattern with distinctive throat stripes and a low ventral count ranging from 207-227 ventrals.

The species *C. bibroni* is further defined by the following suite of characters: 18-22 Maxillary teeth, (versus 17-19 in *C. woolfi* sp. nov. from the Lau Group of islands), 53-59 subcaudals (versus 45-56 in *C. woolfi* sp. nov. from the Lau Group of islands), 10-16 supralabials, 12-17 infralabials, 26-30 scale rows behind the head at one head length behind the head (versus 33-34 in *C. woolfi* sp. nov.), 30-37 midbody rows, 19-24 scale rows one headlength anterior to the cloaca, hemipenis forks at subcaudal 6-10.

The species *Candoia woolfi* sp. nov. from the Lau Group of



islands, east of the main Fiji islands is separated from all other species within the *C. bibroni* species complex by the following suite of characters: A blotched pattern without stripes. The tail pattern is much more conspicuous than that of body, the pale bordering of body blotches also replacing darker ground color on the tail; 205-236 ventrals; there are 33-34 scale rows behind the head at one head length behind the head (versus 26-30 in *C. bibroni*).

The species *Candoia kimmooreae* sp. nov. from the island of Kadavu, southern Fiji is separated from all other species within the *C. bibroni* species complex by having a blotched pattern which includes a prominent median throat stripe and no lateral throat stripes. Otherwise this taxon is essentially similar in form to nominate *C. bibroni* as described herein.

The species *Candoia malcolmmaclurei* sp. nov. from the Loyalty Islands, (territory controlled by New Caledonia) is separated from all other species within the *C. bibroni* species complex by having a blotched pattern without stripes and a tail similar in pattern to the body, or alternatively a blotched pattern with throat stripes including a median row of dark spots on anterior ventrals; dark perocular streak from angle of mouth (or angle of jaw) through eye to loreal region, dark spots on lips, and dark spotting on top of head and with a median ventral row of dark spots. Sometimes the colouration is dulled to appear unicolour. The species is further defined by having 13-16 infralabials, 27-30 scale rows on the neck at one head length back, 20-22 scale rows at one headlength anterior to the cloaca, 219-226 ventrals, 53-60 subcaudals and 19-22 maxillary teeth on either side.

The species *Candoia boutrosi* sp. nov. from the islands of Samoa is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: a distinctive blotched dorsal body pattern that is one or other of being distinct or very indistinct, the large dark blotches being the main component of the dorsal midline for the anterior and mid-body, with the lighter blotches dominating the midline posteriorly, reversing on the tail to have the darker blotches dominate on the tail, which remains brightly marked for the whole length. The dorsal colouration is a combination of chocolate brown and beige in distinctly marked animals or a hybrid of this in the indistinctly marked animals. On the head is a well-defined creamish bar on the upper labials above the jawline.

It is also defined as having 12 supralabials bilaterally (in common with the three species from the Fiji Islands), 15-16 infralabials (as for *C. bibroni sensu stricto*), and 31-32 scale rows on the neck, one head length back from the head (versus 26-30 in *C. bibroni sensu stricto*).

*C. boutrosi* sp. nov. is further defined and separated from the other species in the *C. bibroni* complex by the following suite of characters 37-38 mid-body rows, 22-24 scale rows at one head length anterior to the cloaca, 237-252 ventrals, 51-61 subcaudals and 16-18 maxillary teeth on either side.

The species *Candoia niraikanukiwai* sp. nov. from the islands of Wallis and Futuna, including nearby islets is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: It is essentially similar in most respects to *C. boutrosi* sp. nov. from which it differs by having a distinctive well-defined stripe running through the eye on either side of the head and the absence of a well-defined creamish bar on the upper labials above the jawline.

The species *Candoia georgemacintyreii* sp. nov. from the island of Rotuma, is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: 235-240 ventrals, 57-63 subcaudals, 37-39 mid body rows and significant lightening of the upper labials; the dorsal pattern is blotched and semi-distinct and there is significant speckling and markings on the venter.

**Distribution:** *Candoia niraikanukiwai* sp. nov. is known only from the islands of Wallis and Futuna.

**Etymology:** Named in honour of Nirai Karatia Kanukiwa of

George's Park Orchards Service Centre in Ringwood, Victoria, Australia formerly of Park Orchards, Victoria, Australia, for vital logistical support to significant herpetological scientific research projects and Snakebusters wildlife conservation displays for the best part of a decade. It is also fitting that a man of Pacific Island descent should have a Pacific Island species named in his honour. The days of a gross over-representation of Eurocentric patronyms in Zoology should have ended long ago!

#### **CANDOIA GEORGEMACINTYREI SP. NOV.**

**Holotype:** A preserved specimen at the Natural History Museum, London, UK, specimen number: 1897.7.29.13 collected at the island of Rotuma, (territory controlled by Fiji). This is a facility that allows access to its holdings.

**Diagnosis:** The species *Candoia georgemacintyreii* sp. nov. from the island of Rotuma, is separated from all other species within the *C. bibroni* species complex by the following unique suite of characters: 235-240 ventrals, 57-63 subcaudals, 37-39 mid body rows and significant lightening of the upper labials; the dorsal pattern is blotched and semi-distinct and there is significant speckling and markings on the venter.

*Candoia bibroni* and other species described in this paper that were formerly treated as populations of *C. bibroni* are herein defined as being the *C. bibroni* species complex.

The *C. bibroni* species group are those species not included in the *C. hoserae* sp. nov. species group, as defined below.

All species within the *C. bibroni* species complex are separated from all other *Candoia* by having supralabials separated from the eye by the subocular scales, versus *C. carinata* (Schneider, 1801) and *C. paulsoni* (Stull, 1956) which have them entering the eye; preocular differentiated; canthus rostralis rounded; a relatively slender body with lengthwise ridges on the body scales that run parallel to the long axis of the body, versus a stout body with keels on the body scales forming oblique rows as in *C. aspera* (Günther, 1877); ventrals 203-266; subcaudals 44-67. Furthermore the tail more than twice as long as the head, being capable of more than one complete circle of coiling in the vertical plane.

The species *Candoia carinata* (Schneider, 1801) including species and subspecies formerly treated as being within this taxon (e.g. *C. paulsoni* Stull, 1956) is separated from the *C. bibroni* complex by having 2, or rarely 1 or 3 supralabials entering eye; an angulate canthus rostralis, 160-202 ventrals and 35-60 subcaudals.

The species *Candoia aspera* (Günther, 1877) including species and subspecies formerly treated as being within this taxon is separated from the *C. bibroni* complex by having a tail less than twice as long as the head, usually being shorter than the head; is incapable of forming a full circle of coiling in vertical plane; at least on the anterior two-thirds of body are keels of scales forming curved diagonal ridges along the sides, which extend backward and downward towards the belly; 127-153 ventrals; 11-22 subcaudals; no specially enlarged preocular; (supralabials excluded from the eye; canthus rostralis angular).

*Candoia hoserae* sp. nov. and others in the *C. hoserae* sp. nov. species group are defined as the three species from the Solomon Islands, including outliers, as well as the single species from the Banks Islands and nearby New Hebrides.

These species which are defined in detail already in this paper, are all separated from *C. bibroni* and others in the *C. bibroni* species group (being all others in the *C. bibroni* complex) by the form of the postorbital bone, which has its ventral (free) end abruptly flexed backward, as in *C. carinata*, rather than forming a simple crescent arc as seen in *C. bibroni*. In *C. bibroni* the premaxilla has the "typical boine" form described by Frazzetta (1959, 1975), with a large fenestra between the narial vestibules, this fenestra bounded anteriorly by the premaxilla and posteriorly by the nasals; but *C. hoserae* sp. nov. and others in the species group are like *C. carinata* (with which they are sometimes sympatric) in having the intervestibular fenestra largely or

entirely filled in by expansion of the premaxilla.

*Candoia bibrioni* (Hombron and Jacquinot, 1853) *sensu stricto* as defined in this paper, is the taxon from the main Fiji islands including Viti Levu and Vanua Levu and immediately adjacent islands, but not including Kadavu or the islands in the Lau group, each of which has a different species.

The taxon *C. bibrioni* is separated from all other species within the *C. bibrioni* species complex by the following suite of characters: A blotched dorsal pattern with distinctive throat stripes and a low ventral count ranging from 207-227 ventrals.

The species *C. bibrioni* is further defined by the following suite of characters: 18-22 Maxillary teeth, (versus 17-19 in *C. woolfi* sp. nov. from the Lau Group of islands), 53-59 subcaudals (versus 45-56 in *C. woolfi* sp. nov. from the Lau Group of islands), 10-16 supralabials, 12-17 infralabials, 26-30 scale rows behind the head at one head length behind the head (versus 33-34 in *C. woolfi* sp. nov.), 30-37 midbody rows, 19-24 scale rows one headlength anterior to the cloaca, hemipenis forks at subcaudal 6-10.

The species *Candoia woolfi* sp. nov. from the Lau Group of islands, east of the main Fiji islands is separated from all other species within the *C. bibrioni* species complex by the following suite of characters: A blotched pattern without stripes. The tail pattern is much more conspicuous than that of body, the pale bordering of body blotches also replacing darker ground color on the tail; 205-236 ventrals; there are 33-34 scale rows behind the head at one head length behind the head (versus 26-30 in *C. bibrioni*).

The species *Candoia kimmooreae* sp. nov. from the island of Kadavu, southern Fiji is separated from all other species within the *C. bibrioni* species complex by having a blotched pattern which includes a prominent median throat stripe and no lateral throat stripes. Otherwise this taxon is essentially similar in form to nominate *C. bibrioni* as described herein.

The species *Candoia malcolmaclurei* sp. nov. from the Loyalty Islands, (territory controlled by New Caledonia) is separated from all other species within the *C. bibrioni* species complex by having a blotched pattern without stripes and a tail similar in pattern to the body, or alternatively a blotched pattern with throat stripes including a median row of dark spots on anterior ventrals; dark perocular streak from angle of mouth (or angle of jaw) through eye to loreal region, dark spots on lips, and dark spotting on top of head and with a median ventral row of dark spots. Sometimes the colouration is dulled to appear unicolour. The species is further defined by having 13-16 infralabials, 27-30 scale rows on the neck at one head length back, 20-22 scale rows at one headlength anterior to the cloaca, 219-226 ventrals, 53-60 subcaudals and 19-22 maxillary teeth on either side.

The species *Candoia boutrosi* sp. nov. from the islands of Samoa is separated from all other species within the *C. bibrioni* species complex by the following unique suite of characters: a distinctive blotched dorsal body pattern that is one or other of being distinct or very indistinct, the large dark blotches being the main component of the dorsal midline for the anterior and mid-body, with the lighter blotches dominating the midline posteriorly, reversing on the tail to have the darker blotches dominate on the tail, which remains brightly marked for the whole length. The dorsal colouration is a combination of chocolate brown and beige in distinctly marked animals or a hybrid of this in the indistinctly marked animals. On the head is a well-defined creamish bar on the upper labials above the jawline.

It is also defined as having 12 supralabials bilaterally (in common with the three species from the Fiji Islands), 15-16 infralabials (as for *C. bibrioni sensu stricto*), and 31-32 scale rows on the neck, one head length back from the head (versus 26-30 in *C. bibrioni sensu stricto*).

*C. boutrosi* sp. nov. is further defined and separated from the other species in the *C. bibrioni* complex by the following suite of characters 37-38 mid-body rows, 22-24 scale rows at one head

length anterior to the cloaca, 237-252 ventrals, 51-61 subcaudals and 16-18 maxillary teeth on either side.

The species *Candoia niraikanukiwai* sp. nov. from the islands of Wallis and Futuna, including nearby islets is separated from all other species within the *C. bibrioni* species complex by the following unique suite of characters: It is essentially similar in most respects to *C. boutrosi* sp. nov. from which it differs by having a distinctive well-defined stripe running through the eye on either side of the head and the absence of a well-defined creamish bar on the upper labials above the jawline.

**Distribution:** *Candoia georgemacintyre* sp. nov. is restricted to the island of Rotuma, controlled politically by Fiji.

**Etymology:** Named in honour of George Hayden McIntyre of George's Park Orchards Service Centre in Ringwood, Victoria, Australia formerly of Park Orchards, Victoria, Australia, for vital logistical support to significant herpetological scientific research projects and Snakebusters wildlife conservation displays for the best part of a decade.

#### NOTES ON THE DESCRIPTIONS FOR ANY POTENTIAL REVISORS

Unless mandated by the rules of the *International Code of Zoological Nomenclature*, none of the spellings of the newly proposed names should be altered in any way. Should one or more newly named taxa be merged by later authors to be treated as a single species, the order of priority of retention of names should be the order (page priority) of the formal descriptions within this text.

#### REFERENCES CITED

- Adler, G. H., Austin, C. C. and Dudley, R. 1995. Dispersal and speciation of skinks among archipelagos in the tropical Pacific Ocean. *Evolutionary Ecology* 9:529-541.
- Austin, C. C. 2000. Molecular phylogeny and historical biogeography of Pacific Island boas (*Candoia*). *Copeia* 2000(2):341-352.
- Austin, C. C., Rittmeyer, E. N., Richards, S. J. and Zug, G. R. 2010. Phylogeny, historical biogeography and body size evolution in Pacific Island Crocodile skinks *Tribolonotus* (Squamata; Scincidae). *Molecular Phylogenetics and Evolution* 57(1):227-236.
- Balsai, M. J. 1995. Husbandry and Breeding of the Solomon Islands Prehensile-tailed Skink, *Corucia zebrata*. *The Vivarium* 7(1):4-11.
- Barbour, T. 1921. Reptiles and amphibians from the British Solomon Islands. *Proc. New England zool. Club* 7:91-112.
- Bauer, A. M. 1999. The terrestrial reptiles of New Caledonia: The origin and evolution of a highly endemic herpetofauna. in: Ota, H. (ed.) *Tropical Island Herpetofauna: Origin, Current Diversity, and Conservation*. Elsevier, pp:3-25.
- Bauer, A. M. and Sadler, R. A. (eds.) 2000. *The herpetofauna of New Caledonia*. Contributions to Herpetology, 17; Society for Study Amphibians and Reptiles (SSAR), Ithaca, New York.
- Bauer, A. M. and Vindum, J. V. 1990. A checklist and key to the herpetofauna of New Caledonia, with remarks on biogeography. *Proc. Cal. Acad. Sci.* 47(2):17-45.
- Böhme, W., Philipp, K. and Ziegler, T. 2002. Another new member of the *Varanus* (*Euprepiosaurus*) *indicus* group (Sauria: Varanidae): an undescribed species from Rennell Island, Solomon Islands. *Salamandra* 38(1):15-26.
- Boulenger, G. A. 1884. Diagnoses of new reptiles and batrachians from the Solomon Islands, collected and presented to the British Museum by H. B. Guppy, Esq., M. B., H. M. S. 'Lark.'. *Proc. Zool. Soc. London* 1884:210-213.
- Boulenger, G. A. 1885. *Catalogue of the Lizards in the British Museum (Nat. Hist.) I. Geckonidae, Eublepharidae, Uroplattidae, Pygopodidae, Agamidae*. London:450 pp.
- Boulenger, G. A. 1886. On the reptiles and batrachians of the Solomon Islands. *Trans. Zool. Soc. London* 12:35-62.

- Boulenger, G. A. 1890. Fourth contribution to the herpetology of the Solomon Islands. *Proc. Zool. Soc. London* 1890:30-31.
- Boulenger, G. A. 1893. *Catalogue of the snakes in the British Museum (Nat. Hist.) I*. London (Taylor and Francis):448 pp.
- Boulenger, G. A. 1897. On the reptiles of Rotuma Island, Polynesia. *Ann. Mag. Nat. Hist.* (6)20:306-307.
- Boulenger, G. A. 1898. Description of a new death adder (*Acanthophis*) from central Australia. *Ann. Mag. nat. Hist.* (7)2:75.
- Brongniart, A. 1800. Essai d'une classification naturelle des reptiles. *Bull. Soc. Philomath.* 2(36):89-91.
- Brown, W. C. 1991. Lizards of the genus *Emoia* (Scincidae) with observations on their evolution and biogeography. *Memoirs of the California Academy of Sciences* 15: i-vi,1-94.
- Bruns, T. R., Vedder, J. R. and Cooper, A. K. 1989. Geology of the Shortland Basin Region, Central Solomons Trough, Solomon Islands - Review and New Findings. pp. 125-144 in Vedder, J.G., and Bruns, T. R., (editors), 1989. Geology and offshore resources of Pacific island arcs Solomon Islands and Bougainville, Papua New Guinea Regions: Houston, Texas, Circum-Pacific Council for Energy and Mineral Resources, Earth Science Series, v. 12.
- Cogger, H. G. 1972. A new scincid lizard of the genus *Tribolonotus* from Manus Island, New Guinea. *Zool. Mededelingen* 47:202-210.
- Colvée, S. and Weffer, E. 2004. *Candoia aspera* - The Short-Tailed Ground Boa. *Reptilia* (GB) (33):43-49.
- Colvée, S. and Martín, A. 2005. Keeping Pacific Island Boas of the Genus *Candoia*. *Reptilia* (GB)(39):73-77.
- Court of Appeal Victoria 2014. Hoser v Department of Sustainability and Environment [2014] VSCA 206 (5 September 2014).
- Dahl, A. L. 1986. *Review of the protected areas system in Oceania*. IUCN/UNEP, Gland, Switzerland.
- Daza, J. D., Bauer, A. M., Sand, C., Lilley, I., Wake, T. A. and Valentin, F. 2015. Reptile Remains from Tiga (Tokanod), Loyalty Islands, New Caledonia. *Pacific Science* Oct 2015, 69(4):531-557.
- de Rooij, N. 1917. *The Reptiles of the Indo-Australian Archipelago. II. Ophidia*. Leiden (E. J. Brill), xiv+334 S.
- D'Hondt, S., Pocklany, R., Spivack, A. and Smith, D. 2009. Subseafloor Sediment In South Pacific Gyre One Of Least Inhabited Places On Earth. *Proceedings of the National Academy of Sciences of the United States of America*. 11651(6).
- Duméril, A. M. C. and Bibron, G. 1839. *Erpétologie Générale on Histoire Naturelle Complète des Reptiles*. Vol.5. Roret/Fain et Thunot, Paris:871 pp.
- Duméril, A. M. C. and Bibron, G. 1844. *Erpétologie Générale ou Histoire Naturelle Complete des Reptiles*. Vol.6. Libr. Encyclopédique Roret, Paris, 609 pp.
- Duméril, A. M. C. and Duméril, A. H. A. 1851. *Catalogue méthodique de la collection des reptiles du Muséum d'Histoire Naturelle de Paris*. Gide et Baudry/Roret, Paris:224 pp.
- Forcart, L. 1951. Nomenclature Remarks on Some Generic Names of the Snake Family Boidae. *Herpetologica* 7:197-199.
- Frazzetta, T. H. 1959. Studies on the morphology and function of the skull in the Boidae (Serpentes). Part I. Cranial differences between *Python sebae* and *Epicrates cenchrus*. *Bull. Mus. comp. Zool. Harvard*, 119:453-472.
- Frazzetta, T. H. 1975. Pattern and instability in the evolving premaxilla of boine snakes. *Amer. Zool.*, 15:469-481.
- Garman, S. 1901. Some reptiles and batrachians from Australasia. *Bull. Mus. Comp. Zool. Harvard* 39:1-14.
- Gill, B. J. 1993. The Land Reptiles of Western Samoa. *Journal of the Royal Society Of New Zealand* 23(2):79-89.
- Gill, B. J. 1995. Notes on the land reptiles of Wallis and Futuna, South-west Pacific. *Records of the Auckland Institute and Museum*, 32:55-61.
- Gray, J. E. 1856. New genus of fish-scaled lizards (Scissosarae) from New Guinea. *Ann. Mag. Nat. Hist.* (2)18:345-346.
- Greer, A. E. 1982. A new species of *Geomyersia* (Scincidae) from the Admiralty Islands, with a summary of the genus. *Journal of Herpetology* 16(1):61-66.
- Greer, A. E. and Parker, F. 1967. A new scincid lizard from the northern Solomon Islands. *Breviora* (275):1-20.
- Greer, A. E. and Simon, M. 1982. *Fojia bumui*, an unusual new genus and species of scincid lizard from New Guinea. *Journal of Herpetology* 16(2):131-139.
- Günther, A. 1877. On a collection of reptiles and fishes from Duke of York Island, New Ireland, and New Britain. *Proc. zool. Soc. London* 1877:127-132.
- Hagen, I. J., Donnellan, S. C. and Bull, M. 2012. Phylogeography of the prehensile-tailed skink *Corucia zebrata* on the Solomon Archipelago. *Ecology and Evolution* (2012), 2(6):1220-1234.
- Hall, R., 2002. Cenozoic geological and plate tectonic evolution of SE Asia and the SW Pacific: computer-based reconstructions, model and animations. *J. Asian Earth Sci.* 20:353-431.
- Hamilton, A. M., Klein, E. R. and Austin, C. C. 2010. Biogeographic Breaks in Vanuatu, a Nascent Oceanic Archipelago. *Pacific Science* 64(2):149-159.
- Harvey, M. B., Barker, D. G., Ammerman, L. K. and Chippendale, P. T. 2000. Systematics of pythons of the *Morelia amethystina* complex (Serpentes: Boidae) with the description of three new species. *Herpetological Monographs* (The Herpetologists League Incorporated) 14:139-185.
- Higgins, H. 1943. A Few Reptiles from Western Samoa. *Copeia* 1943(1):59.
- Hoser, R. T. 1995. The Australian Broad-headed Snake *Hoplocephalus bungaroides*. *The Reptilian Magazine* (UK), 3(10):15-27 and cover.
- Hoser, R. T. 1998. Death Adders (Genus *Acanthophis*): An overview, including descriptions of five new species and one subspecies. *Monitor - Journal of the Victorian Herpetological Society Inc.* 9(2):20-41.
- Hoser, R. T. 2013. Tidying up the taxonomy of the extant Booidea, including the erection and naming of two new families, the description of *Acrantophis sloppi* sp. nov., a new species of Ground Boa from Madagascar and *Candoia aspera iansimpsoni*, subsp. nov., a new subspecies of Boa from Papua New Guinea. *Australasian Journal of Herpetology* 16:3-8.
- Hoser, R. T. 2014. Tidying up Death Adder taxonomy (Serpentes: Elapidae: *Acanthophis*): including descriptions of new subspecies and the first ever key to identify all recognized species and subspecies within the genus. *Australasian Journal of Herpetology* 23:22-34.
- Ineich, I. 2008. A new arboreal *Lepidodactylus* (Reptilia: Gekkonidae) from Espiritu Santo Island, Vanuatu: from egg to holotype. *Zootaxa* 1918:26-38.
- Ineich, I. 2009. The terrestrial herpetofauna of Torres and Banks Groups (northern Vanuatu), with report of a new species for Vanuatu. *Zootaxa* 2198:1-15.
- Ineich, I. 2011. Amphibians and reptiles. In: Bouchet P., Le Guyader, H. and Pascal, O. (eds), *The Natural History of Santo*. pp. 187-236. MNHN, Paris; Ird, Marseille; PNI, Paris:572 pp. (Patrimoines naturels; 70).
- Iskandar, D. T. and Erdelen, W. R. 2006. Conservation of amphibians and reptiles in Indonesia: issues and problems. *Amphibian and Reptile Conservation* 4(1):60-87.
- Jacquinet, H. and Guichenot, A. 1853. Reptiles et poissons. In: Hombron and Jacquinet, *Zoologie* 3, in: *Dumont d'Urville, Voyage au Pole Sud et dans l'Oranie sur les corvettes*

- "l'Astrolabe" et "la Zélée", ... Gide and J. Baudry, Paris:56 pp.
- Keith, P. and Marquet, G. 2006. *Stenogobius (Insularigobius) keletaona*, a new species of freshwater goby from Futuna Island (Teleostei: Gobiidae). *Cybiurn* 30(2):139-143.
- Keith, P. and Marquet, G. 2007. *Stiphodon rubromaculatus*, a new species of freshwater goby from Futuna Island (Gobioidi: Sicydiinae). *Cybiurn* 31(1):45-49.
- Keith, P., Marquet, G. and Watson, R. E. 2008. *Akihito futuna*, a new species of freshwater goby from the South Pacific (Gobioidi: Sicydiinae). *Cybiurn* 31(4):471-476.
- Keith, P., Lord, C., Lorion, L., Watanabe, S., Tsukamoto, K., Couloux, A. and Dettai, A. 2011. Phylogeny and biogeography of Sicydiinae (Teleostei: Gobiidae) inferred from mitochondrial and nuclear genes. *Marine Biology* 158(2):311-326.
- Keogh, S. J., Scott, A. W., Fitzgerald, M. and Shine, R. 2003. Molecular phylogeny of the Australian venomous snake genus *Hoplocephalus* (Serpentes, Elapidae) and conservation genetics of the threatened *H. stephensii*. *Conservation Genetics* 4:57-65.
- Keogh, S. J., Edwards, D. L., Fisher, R. N. and Harlow, P. S. 2008. Molecular and morphological analysis of the critically endangered Fijian iguanas reveals cryptic diversity and a complex biogeographic history. *Phil. Trans. R. Soc. B.* 363:3413-3426.
- Kinghorn, J. R. 1928. Herpetology of the Solomon Islands. *Rec. Austral. Mus.* 16:123-178.
- Kinghorn, J. R. 1937. A new species of skink from the Solomon Islands. *Records of the Australian Museum* 20(1):1-2.
- Koch, A., Arida, E., Schmitz, A., Böhme, W. and Ziegler, T. 2009. Refining the polytypic species concept of mangrove monitors (Squamata: *Varanus indicus* group): a new cryptic species from the Talaud Islands, Indonesia, reveals the underestimated diversity of Indo-Australian monitor lizards. *Australian Journal of Zoology* 57(1):29-40.
- Mayr, E. 1931. Birds collected during the Whitney South Sea Expedition. XVI. Notes on fantails of the genus *Rhipidura*. *American Museum Novitates* 502:1-21
- McCoy, M. 1980. *Reptiles of the Solomon Islands*. Wau Ecology Institute Handbook 7. Wau Ecology Institute, Wau, Papua New Guinea.
- McCoy, M. 2006. *Reptiles of the Solomon Islands*. Pensoft Series Faunistica 57:212 pp.
- McDiarmid, R. W., Campbell, J. A. and Touré, T. A. 1999. *Snake species of the world. Vol. 1*. Herpetologists' League:511 pp.
- McDowell, S. B. 1970. On the status and relationships of the Solomon Island elapid snakes. *Journal of Zoology*, London 161:145-190.
- McDowell, S. B. 1979. A catalogue of the snakes of New Guinea and the Solomons, with special reference to those in the Bernice P. Bishop Museum. Part III. Boinae and Acrochordoidea (Reptilia: Serpentes). *Journal of Herpetology* 13:1-92.
- Medway, L. 1974. A new skink (Reptilia: Scincidae: genus *Emoia*) from the New Hebrides, with comments on the status of *Emoia samoensis loyaltiensis* (ROUX). *Bull. Brit. Mus. Nat. Hist., London*, 27:53-57.
- Mertens, R. 1928. Neue Inselrassen von *Cryptoblepharus boutonii* (Desjardin). *Zool. Anz.* 78:82-89.
- Mertens, R. 1931. *Ablepharus boutonii* (DESJARDIN) und seine geographische Variation. *Zool. Jahrb. Syst.* 61:63-210.
- Montrouzier 1860. [Untitled note on *Boa australis*]. *Rev. et Mag. Zool.*xii:95.
- Morrison, C. 2003. *A Field Guide to the Herpetofauna of Fiji*. Suva, Fiji: Institute of Applied Sciences, University of the South Pacific:121 pp.
- Mys, B. 1988. The zoogeography of the scincid lizards from North Papua New Guinea (Reptilia: Scincidae). I. The distribution of the species. *Bull. Inst. Roy. Sci. Nat. Belgique (Biologie)* 58:127-183.
- Ogilby, J. D. 1890. Report on a zoological collection from the Solomon Islands. Part 2. *Rec. Austr. Mus.* 1:5-7.
- Ota, H., Fisher, R. N., Ineich, I., Case, T. J., Radtkey, R. R. and Zug, G. R. 1998. A new *Lepidodactylus* (Squamata: Gekkonidae) from Vanuatu. *Herpetologica* 54(3):325-332.
- Oxley, B. 2016. *Living National Treasures*, website at: <http://Intreasures.com/vanuatu.html>
- Parker, J. 2012. *Candoia*. *HerpNation* (9):52-60.
- Pianka, E. R. and Vitt, L. J. 2003. *Lizards - Windows to the Evolution of Diversity*. University of California Press, Berkeley:347 pp.
- Pyron, R. A., Burbrink, F. T. and Wiens, J. J. 2013. A phylogeny and revised classification of Squamata, including 4161 species of lizards and snakes. *BMC Evolutionary Biology* 13:93.
- Rahmstorf, S. 2003. Thermohaline circulation: The current climate. *Nature* 421(6924):699-699. doi:10.1038/421699a. PMID 12610602.
- Reeder, T. W. 2003. A phylogeny of the Australian *Sphenomorphus* group (Scincidae: Squamata) and the phylogenetic placement of the crocodile skinks (*Tribolonotus*): Bayesian approaches to assessing congruence and obtaining confidence in maximum likelihood inferred relationships. *Molecular Phylogenetics and Evolution* 27:384-397.
- Richmond, J. Q., Wood, D. A., Stanford, J. W. and Fisher, R. N. 2014. Testing for multiple invasion routes and source populations for the invasive brown treesnake (*Boiga irregularis*) on Guam: implications for pest management. *Biological Invasions*. 19 June:13 pp.
- Ride, W. D. L. (ed.) et al. (on behalf of the International Commission on Zoological Nomenclature) 1999. *International code of Zoological Nomenclature* (Fourth edition). The Natural History Museum - Cromwell Road, London SW7 5BD, UK (also commonly cited as "The Rules", "Zoological Rules" or "ICZN 1999").
- Rittmeyer, E. N. and Austin, C. C. 2015. Combined next-generation sequencing and morphology reveal fine-scale speciation in Crocodile Skinks (Squamata: Scincidae: *Tribolonotus*). *Mol. Ecol.* 2015 Jan, 24(2):466-83. doi: 10.1111/mec.13030. Epub 2015 Jan 9.
- Robinson, G. S. 1974. *Macrolepidoptera of Fiji and Rotuma: a taxonomic and biogeographic study*.
- Durham theses, Durham University. Available at Durham E-Theses Online: <http://etheses.dur.ac.uk/8237/>
- Rodda, G. H. and Fritts, T. H. 1992. The Impact of the Introduction of the Colubrid Snake *Boiga irregularis* on Guams Lizards. *Journal of Herpetology* 26(2):166-174.
- Rodda, G. H. and Savidge, J. A. 2010. Biology and Impacts of Pacific Island Invasive Species. 2. *Boiga irregularis*, the Brown Tree Snake (Reptilia: Colubridae). *Pacific Science* (2007), 61(3):307-324.
- Rodda, G. H., Fritts, T. H., McCoid, M. J. and Campbell, E. W. III. 1999. An overview of the biology of the Brown Tree-snake, *Boiga irregularis*, a costly introduced pest on Pacific Islands. pp. 44-80 in Rodda, G. H. Sawai, Y., Chiszar, D. and Tanaka, H. (eds.), *Problem snake management: The Habu and the Brown Tree-snake*. Cornell University Press, Ithaca, New York.
- Russell, E. and Coupe, S. 1984. *The Macquarie World Illustrated Atlas*. Kevin Weldon, Macquarie Library, Chatswood, NSW, Australia:511 pp.
- Roemmich, D. 2007. Physical oceanography: Super spin in the southern seas. *Nature* 449(7158):34-35. doi:10.1038/449034a. PMID 17805284.
- Roux, J. 1913. Les reptiles de de la Nouvelle-Calédonie et des îles Loyalty. pp. 79-160 in: *Nova Caledonia, Recherches scientifiques en Nouvelle Calédonie et aux Iles Loyalty*. *Zoologie*. (vol. 1, L. 2). Sarasin, F. and Roux, J. (eds.). C.W. Kreidel's Verlag, Wiesbaden,

Sadler, R. A. and Bauer, A. M. 1997. The terrestrial herpetofauna of the Loyalty Islands. *Pacific Sci.* 51(1):76-90.

Schmidt, D. 2010. Vermehrung und Zucht von Riesenschlangen. *Draco* 11(44):4-17.

Schmidt, K. P. 1932. Reptiles and Amphibians from the Solomon Islands. *Field Mus. Nat. Hist. Zool. Ser.* 18(9):175-190.

Schmidt, K. P. and Burt, C. E. 1930. Herpetological results of the Whitney South Sea Expedition V. Description of *Emoia sanfordi*, a new lizard from islands of the Western Pacific (Scincidae). *American Museum Novitates* (436):1-3.

Schweizer, H. 1970. Farbwechsel bei einer Pazifik-Boa (*Candoia bibroni australis* Montrousier, 1860). *Aqua Terra* 7(2):19-22.

Sibley, C. G. and Monroe, B. L. 1990. *Distribution and taxonomy of birds of the world*. Yale University Press, New Haven, USA:xxiv+1111 pp.

Stull, O. G. 1956. Description of a new subspecies of the boid snake, *Enygrus carinatus*. *Copeia* 1956(3):185-186.

VCAT 2015. *Hoser v Department of Environment Land Water and Planning (Review and Regulation)* [2015] VCAT 1147 (30 July 2015).

Wells, R. W. and Wellington, C. R. 1985. A classification of the Amphibia and Reptilia of Australia. *Australian Journal of Herpetology Supplementary Series* (1):1-61.


Williams, E. E. and Parker, F. 1964. The snake, genus *Parapistocalamus* on Bougainville, Solomon Islands. *Senckenberg. biol.* 45:543-552.

Zug, G. R. 2012. A new species of treeskink (Squamata: Scincidae: *Emoia samoensis* species group) from Rotuma, south-central Pacific. *Proceedings of the Biological Society of Washington* 125(1):74-84.

Zug, G. R. 2013. *Reptiles and Amphibians of the Pacific Islands*. University of California Press, Berkeley, USA:306 pp.

**CONFLICT OF INTEREST**

The author has no known conflicts of interest in terms of this paper and conclusions within.



Corporate Design  
Et Print Solutions

**No.22145**

**TAX INVOICE**

Kwik Kopy Printing Box Hill  
3/1031 Whitehorse Road  
Box Hill VIC 3128  
t: 039 899 0833 | f: 039 899 0536  
ABN: 65 740 679 782

---

**CONTACT**  
Australasian Journal of Herpetology

**INVOICE DETAILS**  
Issue Date: 21/09/2015  
Ship Via:

QUANTITY	DESCRIPTION	VALUE Ex. GST
50	Australasian Journal of Herpetology Issue 31 - 64 page document printed black and white on 128gsm gloss and 250gsm gloss cover in colour	\$227.27
50	Australasian Journal of Herpetology Issue 32 - 64 page document printed black and white on 128gsm gloss and 250gsm gloss cover in colour	\$227.27

SUBTOTAL	\$454.54
GST	\$45.45
<b>TOTAL</b>	<b>\$499.99</b>

**RECEIVED BY:** \_\_\_\_\_ **DATE:** \_\_\_\_\_

**Terms:** **Please refer to terms & conditions of trade** Account customers, please pay in full, on pickup. We accept Payment no statement issued, C.O.D. customers please pay in full, on pickup. We accept Payment via EFT POS, Mastercard, Visa & Amex. All card transactions will incur a 2% surcharge You can deposit directly into our bank account, E. & O.E All claims and returned goods are to be accompanied by this invoice, and made within 7 days of receipt of goods

**CUSTOMER:** Australasian Journal of Herp  
INVOICE No.: 22145  
INVOICE Tot.: \$499.99

**REMITTANCE ADVICE: RETURN WITH PAYMENT**

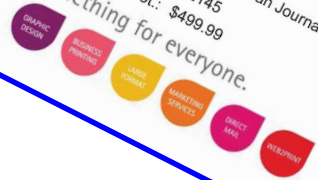
Method: **Suechess Pty Ltd | Bank: Westpac | BSB: 033 172 | Acc: 334 219**

Amount: \$ \_\_\_\_\_  
Card No.: \_\_\_\_\_  
Name: \_\_\_\_\_

CASH CHEQUE OTHER\*  
Expires: \_\_\_\_\_ Date: \_\_\_\_\_ CCV: \_\_\_\_\_

\*see terms of trading for conditions of payment by other methods

Something for everyone.



# A new species of *Denisonia* from North-west Queensland, Australia (Serpentes: Elapidae).

RAYMOND T. HOSER

488 Park Road, Park Orchards, Victoria, 3134, Australia.

Phone: +61 3 9812 3322 Fax: 9812 3355 E-mail: snakeman (at) snakeman.com.au

Received 3 September 2015, Accepted 19 September 2015, Published 1 August 2016.

## ABSTRACT

A new species of elapid snake of the genus *Denisonia* Krefft, 1869 from North West Queensland is formally described according to the rules of the *International Code of Zoological Nomenclature*.

The species has for many years been treated as a population of the species *Denisonia devisi* Waite and Longman, 1920 or occasionally as aberrant *D. maculata* (Steindachner, 1867). Distributionally and physically, these snakes sit more-or-less between the two.

*Denisonia devisi* is primarily an inhabitant of black soil river flats associated with the Darling River and Northern Lake Eyre basins in inland Eastern Australia. *D. maculatus* is an inhabitant of Eastward flowing drainages in the dry zone between the south-east and North east Queensland wet zones, principally the Fitzroy and Burdekin River systems.

This newly described taxon, *Denisonia gedyei* sp. nov. is primarily an inhabitant of the Flinders River system, draining into the Gulf of Carpentaria and may be more widely distributed than current museum records indicate.

**Keywords:** Taxonomy; *Denisonia*; new species; *gedyei*; Queensland; Australia; elapid; snake; *devisi maculatus*; Flinders River; Gulf of Carpentaria.

## INTRODUCTION

As part of a study of Australian snakes spanning more than 40 years, the genus *Denisonia* Krefft, 1869 was scrutinized in detail. In the 1970's I became the first person known to have bred them in captivity, this being the breeding of a pair of *D. devisi* originally caught from north-west of Nevertire in western New South Wales.

Capture of specimens of both recognized species of *Denisonia*, namely *D. devisi* Waite and Longman, 1920 and *D. maculatus* (Steindachner, 1867) by myself and others indicated regional variation. This appeared to be mainly of a clinal nature.

However specimens from the region between Mount Isa and Charters Towers in Queensland appeared to be intermediate between the two recognized species and no clines between these and the other two recognized taxa were known.

*D. devisi* is found south of this area, while *D. maculatus* is found to the east and south-east.

As recently as 2014, Cogger (2014) stated that the only obvious difference between the two species was the presence or absence of bands on the body of either taxon, although the bands on aged specimens of *D. devisi* are sometimes hard to detect, but appear to always be present. Scalation and other characteristics were identical for both species, although Cogger (2014) reported average maximum size of the species being marginally different, but of no diagnostic help in separating the taxa.

As mentioned in the abstract, *Denisonia devisi* is primarily an inhabitant of black soil river flats associated with the Darling River and Northern Lake Eyre basins in inland Eastern Australia. *D. maculatus* is an inhabitant of Eastward flowing drainages in

the dry zone between the south-east and North east Queensland wet zones, principally the Fitzroy and Burdekin River systems.

This newly described taxon, *Denisonia gedyei* sp. nov. described below is primarily an inhabitant of the Flinders River system, draining into the Gulf of Carpentaria and may be more widely distributed than current museum records indicate.

Names applied to the other two species of *Denisonia* as listed in Cogger *et al.* (1983) are not available for this newly described taxon. These unavailable names are, "*Hoplocephalus ornatus*" De Vis (1884), "*Denisonia ornata*" Krefft (1869) and "*Hoplocephalus muelleri*" Fischer (1885).

Were it not for the distributional differences between the known populations (in separated drainage basins) and the knowledge that *Denisonia* is a uniquely distinctive genus of snake, both morphologically, as seen by the account in Cogger (2014), or by phylogeny e.g. Pyron *et al.* (2013), a strong case could be mounted to treat all *Denisonia* as belonging to a single and variable species, with the three relevant populations being treated as geographical subspecies.

While it is possible that a molecular study of population samples from across the range of the genus may yield cryptic species, these being most likely in populations of *D. devisi*, it is clear that a third form from North-west Queensland is sufficiently distinct as to warrant being treated as its own taxonomic entity.

Being distributionally and reproductively isolated from the other two recognized species and easily diagnosed and separated from the others on the basis of colouration and patterning, with no known intermediates, in spite of inspection of specimens from close localities on the relevant boundaries for each form, I have no hesitation in formally naming this taxon as a new

species, namely *Denisonia gedyei* sp. nov.

The formal description follows.

As a passing note, I should add that further survey work will almost certainly yield further populations of *D. devisi* in parts of the Lake Eyre drainage basin, in areas where to date none have been seen or collected, as well as parts of the Murray Darling basin, that have yet to see specimens collected.

#### **DENISONIA GEDYEI SP. NOV.**

**Holotype:** A preserved specimen at the Museum and Art Gallery of the Northern Territory, Reptile Collection, catalogue number R36392, from Julia Creek in north-west Queensland, Latitude - 20.667, Longitude 141.633.

The Museum and Art Gallery of the Northern Territory is a publicly owned facility that allows access to specimens.

**Diagnosis:** *Denisonia gedyei* sp. nov. is most similar to the two currently recognized species of *Denisonia* as defined by Cogger (2014) and matches the genus diagnosis in that text.

*Denisonia gedyei* sp. nov. is separated from both other species in that genus (*Denisonia*) by the following characters:

There is banding or similar on the neck and/or forebody, and well past the nape, but not on the majority of the body or tail which is clearly unmarked. In *D. maculata* there is no banding or similar at all on the neck or body beyond the nape. In *D. devisi*, there is banding or similar along the length of the entire body, which may or may not include the tail, noting that the tail will invariably have at least a few patches of dark pigment on the dorsal surface, which is not seen in *D. gedyei* sp. nov. or *D. maculata*.

Within the constraints of the above, the three relevant species are characterised and separated from one another as follows:

*D. gedyei* sp. nov. has from 2 to 12 distinctive bands on the upper neck region, which fade to merge into a dorsal body pattern of one colour, characterised by being a brownish colour, with each scale containing a distinctive dark brown or black patch in the anterior section. The tail is distinctly lighter.

*D. maculata* does not have 2-12 distinctive bands on the upper neck and while scales may be darker anteriorly than posteriorly, this is neither obvious or distinctive, in that the body appears at a glance to be of one colour only.

*D. devisi* has a dorsal body pattern consisting of fairly distinct bands or broken bands along the entire length of the body. In some specimens, the bands become skewed to give another form of pattern, but the distinctive body pattern, as opposed to the one colour body scheme of the other two species remains. This remains the case even in faded and older specimens (e.g. as seen on page 85 of Emmott and Wilson 2009).

*D. gedyei* sp. nov. has distinctive white barring of the upper labials, a trait sometimes, but not always seen in the other two species.

*D. gedyei* sp. nov. and *D. maculata* both possess a tail that dorsally is distinctly lighter in colour than the adjacent body. While this sometimes occurs in *D. devisi*, the latter taxon is separated from the other two by patches of dark pigment on a lighter background, versus a one colour tail in the other two (see typical *D. devisi* at top of page 145 of Hoser 1989).

**Distribution:** Known only from the vicinity of Julia Creek, Richmond and Hughenden in mid-north-west Queensland, Australia in the upper reaches of the Flinders River system where it is found immediately in or adjacent to watercourses either under cover by day or active at night. This system drains into the Gulf of Carpentaria and there is a lot of potentially suitable habitat for this taxon north of where it is currently known from. I recommend that fieldwork be conducted in the relevant areas to determine the presence or absence of the taxon here.

That *Denisonia gedyei* sp. nov. appears to be confined to drainages associated with the Flinders River system was confirmed via inspection of specimens from nearby major drainages, these being the upper Darling system, upper lake Eyre drainages and the Burdekin/Fitzroy River systems. Specimens from near Winton appear to conform with typical *D.*

*devisi*, while those from the Burdekin system appear to conform with typical *D. maculata*.

#### **ETYMOLOGY AND RELEVANT NOMENCLATURE COMMENTS**

Named in honour of Andrew Gedye, in recognition of his excellent work with reptiles spanning many decades. His main activity has been in the captive breeding of many rare and potentially threatened species as well as many months of extensive fieldwork in all parts of mainland Australia.

He currently lives in a suburb of Cairns, Queensland.

The subgenus *Geddykukrius* Hoser, 2012 was also named after Andrew Gedye, and herein as first reviser and original author, I note the following: The spelling of Andrew's surname Gedye was incorrect in that paper. Notwithstanding this and in order to maintain stability of nomenclature, the nomen *Geddykukrius* Hoser, 2012 should retain the original spelling as in the original paper.

Similarly in 2014, I named a taxon *Broghammerus reticulatus mandella* subsp. nov., repeatedly mis-spelling the name Nelson Mandela and/or as a result the patronym *mandella*.

I thank the taxonomic vandal, thief and law-breaker Mark O'Shea for pointing out this error on numerous online forums and while much of what Mr. O'Shea has done is beneath contempt and most of what he has written and said about me has been totally untrue, he was within his rights to point out my error in this case and I thank him for this.

Post publication peer (and non-peer) review is as important as that which occurs prior to publication and accuracy of publications and noting of any errors are both paramount goals which should not be subsumed or ignored on the basis of ego, or an author foolishly refusing to admit error when one has been committed.

Notwithstanding the above, and while acknowledging the spelling errors in the first instance, for the same reasons as given for *Geddykukrius* Hoser, 2012, and invoking the same rights as per the International Code of Zoological Nomenclature, the nomen spelling *Broghammerus reticulatus mandella* Hoser, 2014 should not have the original spelling changed.

This paper may be cited as the basis for retention of spelling in both cases.

#### **REFERENCES CITED**

- Cogger, H. G., Cameron, E. E. and Cogger, H. M. 1983. *Zoological Catalogue of Australia (1): Amphibia and Reptilia*. Aust. Gov. Publishing Service, Canberra, ACT, Australia:313 pp.
- Cogger, H. G. 2014. *Reptiles and Amphibians of Australia* (Seventh edition), CSIRO. Sydney, Australia:1064 pp.
- Emmott, A. and Wilson, S. G. 2009. *Snakes of Western Queensland: A field guide*. Desert Channels Queensland, Australia:136 pp.
- Hoser, R. T. 1989. *Australian Reptiles and Frogs*, Pierson and Co., Mosman, NSW, Australia:239 pp.
- Pyron, R. A., Burbrink, F. T. and Wiens, J. J. 2013. A phylogeny and revised classification of Squamata, including 4161 species of lizards and snakes. *BMC Evolutionary Biology* 13:93.
- Ride, W. D. L. (ed.) et al. (on behalf of the International Commission on Zoological Nomenclature) 1999. *International code of Zoological Nomenclature* (Fourth edition). The Natural History Museum - Cromwell Road, London SW7 5BD, UK.
- Waite, E. R. and Longman, H. A. 1920. Description of little-known Australian snakes. *Records of the South Australian Museum* 1:173-180.
- Steindachner, F. 1867. in: *Reise der Österreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859 unter den Befehlen des Commodore B. von Wüllerstorff-Urbair (Zoologie)*, Vol. 1, part 3 (Reptilien p.1-98). K. Gerold's Sohn/Kaiserlich-Königl. Hof- und Staatsdruckerei, Wien [1869 on title page]

#### **CONFLICT OF INTEREST**

The author has no relevant conflicts of interest.

# ***Australasian Journal of Herpetology***

**ISSUE 31, PUBLISHED 1 AUGUST 2016**

ISSN 1836-5698 (Print)  
ISSN 1836-5779 (Online)

