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A reclassification of the Rattlesnakes; species formerly exclusively referred to the Genera *Crotalus* and *Sistrurus* and a division of the elapid genus *Micrurus*.

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ABSTRACT

The genus *Crotalus* as referred to by most taxonomists up to now failed to properly distinguish relationships within the group commonly defined as "rattlesnakes".

This paper principally redefines the phylogenetic rattlesnakes at genus and subgenus levels, formally naming well-recognised species and species groups at genus level for the first time in a configuration never previously published.

In contrast to all previous classifications of the rattlesnakes this paper subdivides them into 9 genera, for which names were previously available for a total of five. For the other four genera, they are formally defined, diagnosed and named for the first time.

A further eight well-defined subgenera are also defined and named for the first time.

The Coral Snake genus *Micrurus* Wagler 1824 *sensu lato*, consists of in excess of 70 species level taxa. Notwithstanding the conservative physical attributes of the genus as recognised, clear and obvious divisions warrant recognition at genus level. One new genus is named herein. In turn it is divided into three subgenera.

Keywords: new taxa; snake; rattlesnake; taxonomy; *Crotalus*; *Sistrurus*; *Micrurus*; *Piersonus*; *Cummingea*; *Hoserea*; *Matteoea*; *Caudisona*; *Aechmophrys*; *Uropsophus*; *Rattlewellsus*; *Edwardsus*; *Cottonus*; *Smythus*; *Pillotus*; *Sayersus*; *Mullinusus*; *Crutchfieldus*; *Hoserelapidea*; *Troianous*; *Binghamus*.

INTRODUCTION

Rattlesnakes are among the most well-studied serpents in the world. For a detailed appraisal of these snakes, see for example Gloyd (1940), Klauber (1972), McDiarmid (1999), Schuett, et. al. (2002), Campbell and Lamar (2004) and the many sources cited therein and other more recent publications that are readily available.

Both predating and postdating those major publications there has been the inevitable disputes among herpetologists in terms of the status of given populations in terms of their species, or subspecies status (see examples below).

However only a handful of new hitherto unknown or

overlooked taxa have been formally named since Klauber's seminal 1972 work, with the bulk of new work (post 2000) involved in resolving the specific status of snakes referred to at the subspecies level for some time prior, largely through the use of new molecular methods.

Newly named taxa based on apparently previously unseen rattlesnakes include: *Crotalus lannomi* Tanner, 1966, *C. tancitarenis* Alvarado-Diaz and Campbell, 2004 and *C. ericsmithi* Campbell and Vilella 2008, but even these distinct new species have close affinities with other earlier named (species-level) taxa as seen in their generic and subgeneric placements below and would in the absence of contrary

evidence readily key out to other species within their assigned genus or subgenus and not another.

(For the above trio of species taxa, *lannomi* and *ericsmithi* to *Cummingea* gen. nov. and *tancitarenensis* to *Cottonus* subgen. nov.).

As mentioned, other taxa first described as subspecies have been elevated to full species ranking or relegated to synonymy based on a number of detailed studies, including molecular.

Some of these studies (post 1990) and results have been ignored for the purposes of this paper pending further confirmation of the results by other herpetologists.

Most authors have referred to the rattlers with (usually nine) large plates on the crown of the head to the genus *Sistrurus*. This is often touted as a "primitive form", with the rest being assigned to the catch-all genus *Crotalus*.

Within the generally recognised genus *Sistrurus*, one of the three species, *S. ravus* is regarded by most authors as quite separate from the other two (e.g. Knight, et. al. 1993, McCranie 1988), with recent papers sometimes reassigning the taxon to "*Crotalus*" (e.g. Bryson, 2007, Valencia Hernandez et. al. 2007, Meik and Pires-dasilva 2009).

This itself creates further problems in that in too many ways the taxon has affinities with other *Sistrurus*.

In reality the only sensible options are to subsume *Sistrurus* within *Crotalus* (as in to "lump") or alternatively to create a new genus for the taxon.

In line with the above and as the placement of *ravus* in *Crotalus* isn't in accordance with all the evidence, it is herein placed in a new formally named genus of it's own, namely *Piersonus* gen. nov.

Within the genus *Crotalus* as recognised to 2008, there are numerous distinct subgroups which should be recognised as genera in their own right, including for example the so-called *atrox* group, *adamanteus*, the so-called long-tailed rattlers and others.

Authors who have tackled the problem of grouping rattlesnakes into their most obvious subgroups include: Gloyd (1940), Klauber (1956) and again in (1972), Brattstrom (1964) and Foote and MacMahon (1977) all as detailed and summarized in Murphy et. al. (2002).

Global studies incorporating rattlesnakes are many and include Pyron et. al. (2010).

Unnamed subgroups are formally named for the first time.

As mentioned in the abstract, the total number of well-defined species groups for all rattlesnakes is now nine (9) well-defined genera, along with an additional eight (8) well-defined subgenera within these.

Some of the herein named subgenera may be elevated by other herpetologists to the rank of full genus.

All are named here either by resurrection of available names or the designation of new ones in accordance with the current zoological code (Ride et. al. 1999).

Numerous phylogeny's have been published, including by Klauber 1972 and more recently several by Murphy et. al. 2002 and others, including those cited already.

The relationships between the species as indicated by the authors have been broadly consistent in spite of various means used to derive their results.

Newly described species (post 1990) derived from the splitting of species into more than one, generally in accordance with subspecies designations, are obviously (and in the absence of evidence to the contrary) to be placed in

the same genus or subgenus, even if not recognised or mentioned in the text of this paper.

Molecular methods are currently being used to identify new species on a regular basis and so it is obvious that the species list/s within this paper will not be complete.

The results of Murphy et. al. (2002), or Pyron et. al. (2010) using molecular data to identify groups of rattlesnakes by relationships broadly accord with those of Klauber (1972) who at the time was relying on virtually everything but molecular data.

Where the results differ, the main cause appears to be a lack of information or data, especially in the case of early conclusions by Klauber (1972 or earlier), shown to be in error by later authors.

Most of Klauber's errors related to rarer or little known taxa for which Klauber had little if any access to specimens.

The purpose of this paper is not to voluminously rehash the detail of these earlier studies, including all the intricate details of their studies and the results.

This paper does not by any means seek to rehash the general knowledge base for rattlesnakes or for that matter provide elaborate descriptions of taxa beyond that deemed necessary to formally resolve the taxonomy and nomenclature of this group of snakes.

Instead this paper's main aim is to formally describe and name the relevant groups at either the genus level or the subgenus level as appropriate to resolve and stabilize the taxonomy and nomenclature of the rattlesnakes in accordance with the ICZN's rules as published in 1999 (effective 2000) (cited here as ICZN 1999 and again as Ride et. al. 1999) and similar conventions.

In the main the phylogeny accepted is similar to that published by Murphy et. al. 2002, with relevant changes in accordance with findings by other authors since then and allowing for the formal descriptions or redefinitions of new taxa at various levels that have been accepted herein.

A logical question that will be asked by some, is why should the "established" genus "*Crotalus*" be split up into the obvious subgroups with their own genus names?

In retort, I'd ask, why hasn't it been split up already?

In answer to the second question, which in part answers the first I note the following.

Klauber's seminal works on the rattlesnakes including Klauber 1972, were regarded by many as the defining tome/s on these snakes. He recognised just two genera (*Sistrurus* and *Crotalus*) in line with most other herpetologists of the time.

As a matter of convenience this position has remained until now.

Reptile taxonomists have tended to look elsewhere in terms of the discovery of new taxa at all levels (for example the South American pitvipers), although for the rattlesnakes there has recently been renewed interest at the species level as new diagnostic methods have been employed.

It's also well-known that there are other available names for some of the subgroups if elevated to the status of genus. In terms of this, there has been confusion among biologists and taxonomists as to which names are available, which are not and which major groups do in fact have names and which don't, as well as the true affinities of the various taxa, which have to a large extent been masked by convergent evolution between species that are not necessarily as close as their similar forms may indicate.

Molecular data published by several authors, as cited in this paper indicates a more ancient split for the various groups than their morphology would imply, giving further weight to the need to split the group up according to obvious phylogenies.

This paper resolves this issue by resurrecting names when available and by assigning new names when none is available.

The net result being an effective tidying up of the taxonomy of the snakes placed until now into the genera "*Crotalus*" and "*Sistrurus*" with all rattlesnake taxa being properly assigned at the genus and subgenus level.

Based in Australia, and looking at this group of snakes (mainly) from the outside, it seems patently obvious that the snakes grouped into the genus "*Crotalus*" until now, should have been split into subgroups, each at the genus level a long time ago.

Comparative splits of taxa as diverse as "*Egernia*" skinks and pythons in Australia (Wells and Wellington (1984) and (for the "*Egernia*"), supported by Gardner et. al. (2008)), and other groups initially lumped in large genera for convenience's sake have long ago had their phylogeny's sorted out and then been split into genera more reflective of the origins and relationships of the component species.

Put simply, the time has come for the same to be done for the group generally known as the rattlesnakes, now consisting of about fifty described and broadly accepted species level taxa and who's ancient origins are now not in doubt.

NOTES ON THE FOLLOWING DESCRIPTIONS

Detail has been kept to a minimum.

For simplicity's sake, generally recognised or named subspecies have been generally ignored unless taxonomically significant in terms of the context of this paper or otherwise worthy of mention.

If a subspecies is relevant in terms of this paper, it is dealt with within this paper.

For convenience's sake the three species often (formerly) assigned to the genus "*Sistrurus*" have been dealt with first and more-or-less separately as they have been readily separated from the others on the basis of head scalation for many years (the large shields at the center of the top of the head) and a suite of other distinctive characters.

This is followed by a brief diagnosis of the genus "*Crotalus*" herein and now restricted to the taxa *C. horridus*, *C. viridis* (and six other species-level taxa formerly treated as subspecies of this taxon) and *C. scutulatus*.

Note that recent authors such as Ashton and de Queiroz (2001) and Campbell and Lamar (2004) elevated *C. oreganus* from *C. viridis*, to be a species in it's own right and *viridis* has also had a further five species extracted from synonymy.

This genus is in turn subdivided to include two subgenera, with one containing *C. horridus* (as the nominate group) and the other the remaining eight recognised species-level taxa (seven derived from (recent) synonymy with *viridis* (*Sayersus* subgen. nov.))

Following are descriptions and diagnosis of the other relevant genera and subgenera, firstly being those for which names are available, but including descriptions, diagnosis and formal naming of the relevant subgroups as subgenera in the context of what is now known and to provide a usable diagnosis for each genus.

In effect each genus has been redescribed and rediagnosed for the first time.

Then are the descriptions, diagnosis and formal naming of the new genera and appropriate subgenera.

Then there is a checklist of known rattlesnakes (as applied in this paper) and their new designations by genus and species.

When listing known species in given genera, the species assigned to subgenera within the genus are listed under the subgenus heading. However they are also incorporated within the genus preceding it, (above) and listed in the subgenus as would be the case when the genus is partitioned into the various subgenus components, and/or in the event that later workers choose to elevate the subgroups to full species level.

The various species within each newly diagnosed and described genus, including those resurrected from the synonymy of "*Crotalus*" as "available names" are generally identified under the name of the new genus, but are readily identifiable by their species names (unchanged from earlier literature), including for example Murphy et. al. 2002 (excluding new taxa described since including for example "*C. tancitarensis*" (2004) and "*C. ericsmithi*"(2008)), both now assigned herein to genera outside "*Crotalus*".

Excluding the newly named taxa as identified herein, all others are described and diagnosed in Klauber 1972 either as species or subspecies, or Campbell and Lamar (2004).

Those descriptions are relied upon herein as the simplest and most expedient means to identify the said taxa in greater detail in the event of conflict in terms of the species names used and/or as alternative means to place in appropriate genus or subgenus as named here and as added diagnostic information for each group if required or needed. Having said that, each species/description does in turn refer back to the original description and the associated museum-based holotype or similar, as applicable by the relevant zoological code/s, which is what is ultimately of utmost importance.

A number of well-recognised subspecies (e.g. "*Crotalus viridis oreganus*") have been shown to be species in their own right by recent authors (e.g. Ashton and de Queiroz 2001 and Douglas et. al. 2002) and are in terms of this paper adopted herein.

The latter authors went even further, splitting what was originally known as *viridis* into a group of seven full species, all previously named as subspecies, but listed here as full species within the subgenus *Sayersus* subgen. nov..

Listed below with their common names the taxa are:

C. viridis - Prairie rattlesnake (including the previously named subspecies *viridis* and *nuntius*, the latter being treated by most authors as a synonym of *C. viridis*)

C. oreganus - Northern Pacific rattlesnake

C. abyssus - Grand Canyon rattlesnake

C. cerberus - Arizona black rattlesnake

C. concolor - Midget faded rattlesnake

C. helleri - Southern Pacific rattlesnake (including the conventional subspecies *caliginis*, which is considered a synonym of *helleri*)

C. lutosus - Great Basin rattlesnake

Some of the many divisions by Grismer (2002) are ignored for the purposes of this paper, although it is my view that the findings of Grismer will be broadly validated by further research.

Furthermore as new methods of research are employed on rattlesnakes, further hidden species may be yielded.

Failure to recognise such newly proposed taxonomic divisions in this paper does not necessarily mean I do not agree with their views.

However exclusion of recently diagnosed species derived from earlier descriptions of subspecies and "races" of species does not alter the generic and subgeneric placement of taxa. That is in that no new groups or potential new groups, genera, subgenera or the like are excluded or potentially excluded and "new" taxa can be readily assigned to the same genus or subgenus group as from where the taxa was "split" by the relevant author (unless compelling contrary information arises).

Taxa, generally regarded as subspecies until recently and since elevated to the status of full species, would as a matter of course be placed in the same genus or subgenus as the taxon from which they were previously regarded as synonymous at the species level unless compelling evidence to the contrary emerges that is not noted in this paper or dealt with by means of species placement within this paper.

If there are any exceptions to this, they are noted in this paper and dealt with appropriately.

In terms of references cited, these have been kept to a bare minimum. Many useful studies inspected and assessed are not cited in this paper or at its end as they are not directly referred to in the text of this paper and/or key findings and conclusions are mirrored in material cited herein. The majority of referred to papers are however cross-cited in the limited number of references provided.

Hence all cited references should be treated as also incorporating those cited within those texts.

In terms of the diagnosis for each genus or subgenus, all other diagnoses in this paper should as needed be incorporated into the given diagnosis. This is because assigning a given taxon to a given group may be made either by directly using the diagnosis and/or by alternatively using the others in a process of elimination.

Alternatively, species level descriptions and/or diagnosis are available for all species level taxa described prior to 1972, in Klauber 1972. Some are described and diagnosed in the Klauber text as subspecies, but listed as full species here.

The species not included in Klauber 1972, but described since (e.g. "*Crotalus ericsmithi*") are readily aligned to other taxa in their respective groupings at genus or subgenus levels and in the absence of other information, would be easily diagnosed in the subgenus they are listed in and would key to another species in that grouping as opposed to a taxon in another genus or subgenus (for *ericsmithi*, it would automatically diagnose as another taxon in *Cummingea* gen. nov. as opposed to any other rattlesnake species listed in another genus or subgenus).

DEFINITION OF THE RATTLESNAKES

Rattlesnakes for the purposes of this paper are defined as follows:

They are (venomous, with fangs to inject venom) pitvipers within what's treated here as the family Crotalidae Oppell 1811. There is considerable published evidence to relegate Crotalidae to the rank of subfamily within the so-called "True vipers" (Viperidae), thereby making pitvipers the Crotalinae subfamily.

I agree with this position and also that of Smith, Smith and Sawin (1977) and assign them all to the tribe Crotalini Oppel, 1811.

The rattlesnake snakes, called rattlesnakes are known only

from the western hemisphere (most species in lower North America, including southern USA and Mexico), which has been guessed by most herpetologists as being the center of evolution for the group.

This however may not be the case as there is a counter-argument that some so-called primitive taxa may in fact have derived their present forms secondarily in relatively recent geological times.

The rattlesnakes are moderate to large and thickset snakes, often with keeled scales.

They are separated from all other venomous pitvipers by the possession of a rattle or pre-button segment which is different to the tail arrangement in any other kind of snake. This assumes that the tail end has not been cut-off, otherwise removed and/or the snake has not suffered an extremely aberrant birth defect, all of which would be self-evident.

Pitvipers, which include numerous genera outside the rattlesnakes genera, are venomous snakes distinguished from other "true vipers" and similar snakes by the presence of a distinct heat-sensing pit organ located between the eye and the nostril on either side of the head.

Excluding the rattlesnakes, the number of named and widely recognised genera has increased in recent times.

GENUS *SISTRURUS* GARMAN 1883

Type species: *Crotalinus catenatus* Rafinesque 1918.

Diagnosis: Large plates on the crown, including the centre, 21-25 mid body rows. Those with 21 mid-body rows and an average tail length (for entire tails in adults) of 9.8 percent or less males or 7.7 percent or less in females (as compared to total body length), (namely *ravus*) are herein referred to the new genus described below, namely *Piersonus* gen. nov.

In *Sistrurus* the lateral hook of the squamosal makes an acute angle (45 to 80 degrees) with the main part of the bone. In *Piersonus* gen. nov., the lateral process of the squamosal is substantially at right angles to the main part of the bone.

In *Sistrurus*, the upper preocular is in contact with the postnasal, the rostral is not curved over the snout, canthus rostralis is sharply angled, dorsal body blotches are square or wider than long. By contrast in *Piersonus* gen. nov. the upper preocular is not in contact with the postnasal, the rostral is curved over the snout, canthus rostralis is rounded, the dorsal body blotches are longer than wide or the colour is black.

Sistrurus are found only in the United States of America and nearby Canada. Records for *Sistrurus* from far northern Mexico, are either doubtful or outliers.

Piersonus gen. nov. occurs in Mexico only and away from the US border.

Species in genus:

S. catenatus (Rafinesque 1818)

S. miliarius (Linne 1766)

GENUS *PIERSONUS* GEN. NOV.

Type Species: *Crotalus ravus* Cope 1865

Diagnosis: Large plates on the crown including the centre, 21 mid-body rows. Relatively short tail as compared to the snakes in the genus *Sistrurus*. For *Piersonus* gen. nov. males have an average tail length of 9.8 percent of the total body length and females 7.7 percent of the total body length. In *Sistrurus* the lateral hook of the squamosal makes an

acute angle (45 to 80 degrees) with the main part of the bone. In *Piersonus* gen. nov., the lateral process of the squamosal is substantially at right angles to the main part of the bone.

In *Sistrurus*, the upper preocular is in contact with the postnasal, the rostral is not curved over the snout, canthus rostralis is sharply angled, dorsal body blotches are square or wider than long. By contrast in *Piersonus* gen. nov. the upper preocular is not in contact with the postnasal, the rostral is curved over the snout, canthus rostralis is rounded, the dorsal body blotches are longer than wide or the colour is black.

McCranie (1988) has also identified significant features and differences in the hemipenes between this and those snakes in the genera *Sistrurus/Crotalus* (as defined prior to this paper).

Sistrurus are found only in the United States of America and nearby Canada. Records for *Sistrurus* from far northern Mexico, are either doubtful or outliers.

Piersonus gen. nov. occurs in Mexico only and away from the US border.

Piersonus gen. nov. is found only in mountainous areas of central and southern Mexico.

Known from the Mexican states of Hidalgo, Mexico, Morelos, Oaxaca, Puebla, Tlaxcala, Veracruz and Federal District.

It's common name is the Mexican Pygmy Rattlesnake.

Etymology: Americans historically have cherished the freedom of the individual.

Included here is the freedom of individuals to keep and study snakes and other wildlife. In recent years this right has come under threat from a raft of ridiculous bureaucratic impediments. In Australia in the early 1970's these rights were removed from most Australians. It was only as a result of the publication of two different books, *Smuggled* and *Smuggled-2* (Hoser 1993 and 1996) that led to these rights being restored to most Australians.

The success in Australia in terms of these books and their legislative outcomes reverberated around the world and in the case of the United States, meant that a major push to outlaw private ownership of reptiles in 1993 was also stopped in its tracks.

Charles Pierson as publisher of the first book, took an incredibly courageous step in publishing the book.

For North Americans reading this, it should be noted that the Australian government (at all levels) has considerably more powers than their North American counterparts and persons publishing material critical of government run the risk of immense fines, jail or similar.

I have suffered both!

The book *Smuggled: The Underground Trade in Australia's Wildlife* (Hoser 1993) was (as totally expected), illegally banned by the NSW National Parks and Wildlife Service, NPWS, NSW in May 1993 and as a result of a supreme effort by Pierson and an extremely brave and courageous journalist Fia Cumming, the ban was lifted.

(Cumming subsequently lost her job as a result of this, but the book became a best-seller).

Fighting the ban ultimately cost Pierson his home in the expensive Sydney suburb of Mosman and he lost his business.

However this huge life-altering sacrifice against the tyranny of a corrupt and oversized bureaucracy should be

permanently recognised. This is especially so in the context of reptiles, those who choose to study them and their conservation, including those many people who have the right to keep live reptiles as pets, solely as a consequence of Pierson's selfless actions.

Pierson also put wildlife conservation on the global agenda, with the publication of the seminal works *Endangered Animals of Australia*, (Hoser 1991) and *Australian Reptiles and Frogs* (Hoser 1989), the latter used extensively by the late Steve Irwin and other television "personalities" as a reference source to bring Australian animals to TV viewers globally.

Unfortunately as this paper goes to press in 2012 there are new assaults on the rights of reptile keepers and herpetologists both in the USA (refer to the "Giant Constrictor ban" with further bans planned to follow) and Australia with new restrictions either passed or about to be passed in both jurisdictions.

Species in genus *Piersonus* gen. nov.

P. ravus (Cope 1865)

OTHER RATTLESNAKE GENERA AS DIAGNOSED AS NEW GENERA BELOW

As part of the diagnosis for each, all are separated from *Sistrurus* and *Piersonus* gen. nov. (described above) by the absence of large head shields at the center of the crown of the head. This difference is not necessarily repeated for the individual diagnoses below, but is of course an obvious part of each diagnosis and should be treated as such.

GENUS *CROTALUS* LINNE 1758

Type Species: *Crotalus horridus* Linne 1758

Diagnosis:

Medium to large rattlesnakes.

They are separated from all other rattlesnake genera by the following suite of characters, either individually and/or in any combination.

The top of the head has scales of various sizes, more than one scale in the frontal area and the parietals, if enlarged are not in contact or symmetrical.

The outer edges of the supraoculars are not extended into raised and flexible hornlike processes that are distinctly pointed at the tip.

Males have less than 40 subcaudals and females less than 35.

There are two or more internasals. The tail has rings which may or may not be distinct, unless the tail is black.

The pattern is generally of blotches, as opposed to say crossbands (like in *Uropsophus*).

Unlike the genus *Hoserea* gen. nov. (below) the tail does not have distinct dark and light bands of similar width and/or if they do, they merge into the dorsal pattern anterior to this, as opposed being of a distinct cocoon-like appearance as distinct from the dorsal pattern before it.

All *Hoserea* gen. nov. are separated from other rattlesnakes by their tail markings. In the case of *Hoserea*, there are distinct thickened dark and light cross-bands of similar width, which are separate from the rest of the snake's dorsal markings, giving the tail a cocoon-like appearance. This bold patterning is not seen in other rattlesnakes.

Another diagnostic for that genus is that the line markings on the face run up at a sharp 45 degree angle which exceeds that of other rattlesnake genera, excluding *Crotalus* (as

diagnosed here).

However *Crotalus* (as diagnosed here) is separated from the genus *Hoserea* gen. nov. by the tail markings which merge into the dorsal patterning anterior to this, as opposed to being of a separate cocoon-like appearance.

Also *Hoserea* gen. nov. have distinct diamond shaped blotches with light edges running down the spinal region, quite unlike markings seen in other rattlesnakes excluding *Caudisona*, which are in turn readily separated from that subgenus by other factors (see both diagnoses).

C. horridus lacks any vertical or near vertical line running anterior or posterior to the eye.

For *Cummingea* gen. nov., as diagnosed in this paper, they are separated from all other rattlesnake genera by the following suite of characters.

The top of the head has scales of various sizes, more than one scale in the frontal area and the parietals, if enlarged are not in contact or symmetrical.

The outer edges of the supraoculars are not extended into raised and flexible hornlike processes that are distinctly pointed at the tip.

The simplest diagnostic trait of *Cummingea* gen. nov. is that there are more than 40 subcaudals in males and more than 35 in females. In all other rattlesnakes, including *Crotalus* as defined here, there are fewer than 40 subcaudals in males and fewer than 35 in females.

For *Matteoea* gen. nov. those snakes are highly rugose rattlesnakes, separated from other rattlesnakes by distinct salt and pepper markings across the dorsal surface, often giving the appearance of mite faeces, and otherwise described as a "mite phase". This is especially so for *M. mitchellii*, but also applies to others in the genus, namely *M. tigris* and *M. angelensis*.

These snakes also have small scales between the rostral and prenasals. The supraoculars are pitted and creased.

For separation from *Aechmophrys*, *Uropsophus*, *Caudisona*, *Matteoea*, *Hoserea* and *Cummingea*, see the diagnoses below.

Separated from *Sistrurus* and *Piersonus* gen. nov. (described above) by the absence of large head shields at the center of the crown of the head.

Species in genus:

C. horridus Linne 1758

Species in subgenus *sayersus* subgen. nov.

C. viridis (Rafinesque 1818)

C. scutulatus (Kennicott 1861)

C. oregonus Holbrook 1840

C. abyssus Klauber 1930

C. cerberus Klauber 1949

C. concolor Klauber 1936

C. helleri Meek 1905

C. lutosus Klauber 1930

SUBGENUS *SAYERSUS* SUBGEN. NOV.

Type species: *Crotalinus viridis* Rafinesque 1818

Diagnosis: The diagnosis for the subgenus includes as for the genus *Crotalus* above.

In terms of separating the taxa within *Sayerus* subgen. nov. from *Crotalus* (now restricted to *C. horridus*), the following applies. Dark tail rings contrast with a lighter background in *Sayersus* subgen. nov. For the remaining *Crotalus* as in *C. horridus* (not in this subgenus), the tail is uniform black or at

best with very indistinct rings.

There are more than two internasals in snakes of this subgenus as opposed to only two internasals for *C. horridus*, herein restricted to *Crotalus*. *C. scutulatus* is separated from *C. horridus* by the presence of 2 or 3 large scales on the top of the head between the supraoculars.

C. horridus lacks any vertical or near vertical line running anterior or posterior to the eye, which all *Sayersus* subgen. nov. have.

Dorsal pattern and colouration of specimens is highly variable.

Etymology: In honour of the late Ron Sayers, a mainly USA-based herpetologist for his many contributions to our understandings of reptiles in the 20th century, through his practical work as well as many articles, photos and the like. I first met him when catching Death Adders (*Acanthophis antarcticus*) in the late 1970's on the now famous West Head Road, in NSW, Australia, as part of a research project (NSW/NPWS scientific permit number SLF486).

Species in subgenus *Sayersus* subgen. nov.

C. viridis (Rafinesque 1818)

C. scutulatus (Kennicott 1861)

C. oregonus Holbrook 1840

C. abyssus Klauber 1930

C. cerberus Klauber 1949

C. concolor Klauber 1936

C. helleri Meek 1905

C. lutosus Klauber 1930

GENUS *AECHMOPHRYS* COUES 1875

Type species: *Crotalus cerastes* Hallowell 1854

Diagnosis: A group of smaller sized rattlesnakes all with 21 mid body scale rows. One of the group is separated from all other rattlesnakes by the fact that the outer edges of the supraoculars are extended into raised and flexible hornlike processes that are distinctly pointed at the tip. That is the species *cerastes*, known commonly as a "sidewinder" in reference to one of its preferred forms of motion across sand dunes.

For *A. polystictus*, also placed in this genus but herein placed in the subgenus *Rattlewellsus* subgen. nov., it is separated from all other rattlesnakes by the presence of two squarish darker blotches on the upper labials, one at about the eye and running into it and the other anterior to it. *A. polystictus* is further separated from all other rattlesnakes by a dorsal pattern consisting of a series of longitudinal ellipses. It also has a pair of slim intercanthals, each about twice as long as wide.

All others in this genus *Aechmophrys*, herein transferred to the subgenus *Cottonus* subgen. nov. have a distinct whitish streak running across the upper labials running slightly higher towards the snout, and terminating around the back of the mouth region at the posterior end.

Other rattlesnakes with a similar streak invariably have the streak running through the eye, even if only the lower part, which is not the case for this genus.

In the rest of *Aechmophrys* that is not part of the subgenus *Cottonus* subgen. nov., namely *A. cerastes* and *A. polystictus*, there is no such line. In *A. cerastes*, at best there is a squarish light blotch under the eye, while in *A. polystictus*, any white line terminates before (posterior to) the eye.

Cottonus subgen. nov. taxa have distinctly smaller and

narrower heads than those taxa in the nominate subgenus and likewise as compared to the defined (here) genera *Crotalus*, *Caudisona* and *Hoserea*.

For separation from *Crotalus*, *Uropsophus Caudisona*, *Matteoea*, *Hoserea* and *Cummingea* see the diagnoses above or below.

Separated from *Sistrurus* and *Piersonus* gen. nov. (described above) by the absence of large head shields at the center of the crown of the head.

Uropsophus is separated from this genus by the fact that males have less than 40 subcaudals and females less than 35.

Species in genus:

A. cerastes (Hallowell 1854)

Species in subgenus *Cottonus* subgen. nov.

A. intermedius (Troschel 1865)

A. pricei (Van Denburgh 1895)

A. tancitarensis (Alvarado-Diaz and Campbell 2004)

A. transversus (Taylor 1940)

A. willardi (Meek 1905)

Species in subgenus *Rattlewellsus* subgen. nov.

A. polystictus (Cope 1865)

SUBGENUS *COTTONUS* SUBGEN. NOV.

Type species: *Crotalus intermedius* Troschel 1865

Diagnosis: Separated from all other *Aechmophrys* as diagnosed above in this same paper by having a small narrow head.

As for others in the genus, all have 21 mid body scale rows.

Cottonus subgen. nov. as recognised at least in part by Smith (1946) and Klauber (1972) although obviously not by this name (*Cottonus*), is separated from other rattlesnakes and characterised by a dorsal scale row formula of 21-21-17, 8-10 labials (a low number for rattlesnakes), a relatively small head, weak or no keeling in the parietal region, and simple arrangement of relatively few scales on the side of the head.

Further separated from all other *Aechmophrys* by a distinct white line running across the upper labial region including below the eye and terminating around the back of the mouth region at the posterior end. In the rest of *Aechmophrys* that is not part of this subgenus, namely *A. cerastes* and *A. polystictus*, there is no such line. In *A. cerastes*, at best there is a squarish light blotch under the eye, while in *A. polystictus*, any white line terminates before (posterior to) the eye.

Cottonus subgen. nov. taxa have distinctly smaller and narrower heads than those taxa in the nominate subgenus and likewise as compared to the defined (here) genera *Crotalus*, *Caudisona* and *Hoserea*.

Uropsophus is separated from this subgenus (and genus) by the fact that males have less than 40 subcaudals and females less than 35.

Etymology: Named after Australian wildlife demonstrator Tom Cotton in honour of his conservation work with our company "Snakebusters" which leads the way in wildlife conservation in Australia. Tom's educational efforts have brought countless people in contact with reptiles and created a whole generation of herpetologists, scientists and conservationists.

Species in subgenus *Cottonus* subgen. nov.

A. intermedius (Troschel 1865)

A. pricei (Van Denburgh 1895)

A. tancitarensis (Alvarado-Diaz and Campbell 2004)

A. transversus (Taylor 1940)

A. willardi (Meek 1905)

SUBGENUS *RATTLEWELLSUS* SUBGEN. NOV.

Type species: *Caudisona polystictus* Cope 1865

Diagnosis: *Rattlewellsus* subgen. nov. is separated from all other rattlesnakes (including others in the subgenus *Aechmophrys*) by the presence of two squarish darker blotches on the upper labials, one at about the eye and running into it and the other anterior to it. *A. polystictus* is further separated from all other rattlesnakes by a dorsal pattern consisting of a series of longitudinal ellipses. It also has a pair of slim intercanthals, each about twice as long as wide.

This snake is placed within the subgenus *Aechmophrys*, which is a group of smaller sized rattlesnakes all with 21 mid body scale rows. One of the group is separated from all other rattlesnakes by the fact that the outer edges of the supraoculars are extended into raised and flexible hornlike processes that are distinctly pointed at the tip. That is the species *cerastes*, known commonly as a "sidewinder" in reference to one of its forms of motion over sand dunes.

All others in the genus *Aechmophrys*, herein transferred to the subgenus *Cottonus* subgen. nov. have a distinct whitish streak running across the upper labials running slightly higher towards the snout, and terminating around the back of the mouth region at the posterior end.

Other rattlesnakes with a similar streak invariably have the streak running through the eye, even if only the lower part, which is not the case for this genus.

In the rest of *Aechmophrys* that is not part of the subgenus *Cottonus* subgen. nov., namely *A. cerastes* and *A. polystictus* (subgenus *Rattlewellsus* subgen. nov.), there is no such line. In *A. cerastes*, at best there is a squarish light blotch under the eye, while in *A. polystictus*, any white line terminates before (posterior to) the eye.

Cottonus subgen. nov. taxa have distinctly smaller and narrower heads than those taxa in the nominate subgenus and likewise as compared to the defined (here) genera *Crotalus*, *Caudisona* and *Hoserea*.

For separation from *Crotalus*, *Uropsophus Caudisona*, *Matteoea*, *Hoserea* and *Cummingea* see the diagnoses above or below.

Separated from *Sistrurus* and *Piersonus* gen. nov. (described above) by the absence of large head shields at the center of the crown of the head.

Uropsophus is separated from this genus by the fact that males have less than 40 subcaudals and females less than 35.

Etymology: Named after well-known Australian reptile taxonomist Richard Wells. The subgenus name is a play on words in several ways.

It obviously reflects on the kind of snake (rattlesnake) and his own name, "Wells". It also relates to what he did in terms of Australian taxonomy when he published a pair of major papers in 1983 and 1985 (Wells and Wellington 1983, 1985), which "rattled well" many other hereptologists in Australia with his large number of then controversial taxonomic and nomenclatural acts.

Species in subgenus *rattlewellsus* subgen. nov.

A. polystictus (Cope 1865)

GENUS CAUDISONA LAURENTI 1768

Type species: *Crotalus durissus* Linne 1758

Diagnosis: The best known taxon in the genus is the so-called Neotropical Rattlesnake, *C. durissus*. It is listed here as the type species, even though the form originally described was “*terrificus*”, now regarded as a subspecies, including herein.

A number of the recognised species in the genus, were in the first instance described as subspecies of *C. durissus* and later found to be valid species in their own right as herein recognized.

These include: *C. culminates*, *C. simus* and *C. tzabcan*.

Quijada-Mascarenas and Wüster, W. (2006) found the group as defined here and similarly in their paper, diverged from all other rattlesnakes about 13 million years ago, making the placement of these snakes in a genus apart from *Crotalus* as previously defined an inevitable position.

The name *Caudisona* Laurenti 1768 is available and herein used.

Snakes of the genus *Caudisona* are defined as follows.

The top of the head has scales of various sizes, more than one scale in the frontal area and the parietals, if enlarged are not in contact or symmetrical.

The outer edges of the supraoculars are not extended into raised and flexible hornlike processes that are distinctly pointed at the tip.

Males have less than 40 subcaudals and females less than 35.

Prenasals contact the rostral. The body pattern comprises diamonds, hexagons, rectangles or ellipses, or if bands, not made up of conspicuous dots; dorsoventral width of the proximal rattle in the head length more than two and a half times. The anterior subocular fails to reach any supralabial. There are two internasals only. The upper preocular is not split vertically, or if split the anterior section is not conspicuously higher than the posterior and not curved over the canthus rostralis in front of the supraocular, dorsal body blotches occupy more longitudinal space than the interspaces, and the pattern of diamonds, hexagons, rectangles or ellipses usually exceeds 24 in number.

There are more than 164 ventrals.

Tail rings are indistinct or absent. There are usually four or less often six or more large flat scales occupying the internasal/prefrontal area and not including the subcanthals or supraloreals.

For further separation from *Aechmophrys*, *Uropsophus*, *Crotalus*, *Matteoea*, *Hoserea* and *Cummingea*, see the diagnoses above or below.

Separated from *Sistrurus* and *Piersonus* gen. nov. (described above) by the absence of large head shields at the center of the crown of the head.

Species in genus:

C. durissus (Linne 1758)

C. culminatus (Klauber 1952)

C. simus (Latreille 1801)

C. tzabcan (Klauber 1952)

C. vegrandis (Klauber 1941)

C. unicolour (van Lidth de Jeude 1887)

Species in subgenus *Pillotus* subgen. nov.

C. enyo Cope 1861

Species in subgenus *Smythus* subgen. nov.

C. basiliscus Cope 1864

C. estebanensis (Klauber 1949)

C. molossus (Baird and Girard 1853)

C. totonacus (Gloyd and Kauffeld 1940)

SUBGENUS PILLLOTUS SUBGEN. NOV.

Type species: *Caudisona enyo* Cope 1861

Diagnosis: The above diagnosis for *Caudisona* Laurenti 1768 defines and separates this subgenus from all other rattlesnakes in combination with the following.

Pillotus subgen nov. is further separated from all other *Caudisona* by scales in the internasal and prefrontal area totalling 12 or more as opposed to 12 or less for all other *Caudisona*. Scales in the crown and in the frontal area are rough, ridged and knobby in *Pillotus* (subgen. nov.) *enyo*, as opposed to the same scales being smooth in all other *Caudisona* species.

Etymology: Named after Australian reptile enthusiast Christian Pillot in honour of his conservation work with our company “Snakebusters – Australia’s best reptiles” which leads the way in wildlife conservation in Australia. Christian’s educational efforts have brought countless people in contact with reptiles and created a whole generation of herpetologists, scientists and conservationists.

Species in subgenus *Pillotus* subgen. nov.

Caudisona enyo Cope 1861

SUBGENUS SMYTHUS SUBGEN. NOV.

Type species: *Crotalus molossus* (Baird and Girard 1853)

Diagnosis: The above diagnosis for *Caudisona* Laurenti 1768 defines and separates this subgenus from all other rattlesnakes in combination with the following.

Pillotus subgen nov. is further separated from all other *Caudisona* and this subgenus by scales in the internasal and prefrontal area totalling 12 or more as opposed to 12 or less for all other *Caudisona*. Scales in the crown and in the frontal area are rough, ridged and knobby in *Pillotus* (subgen. nov.) *enyo*, as opposed to the same scales being smooth in all other *Caudisona* species.

Caudisona that remain in the nominate subgenus as a rule are separated from other *Caudisona* by the fact that on the neck there are a pair of regular dark stripes, one to three scale rows wide separated by a single light mid-dorsal stripe two to three scale rows wide, these stripes extending from one to four head lengths behind the head before they meet the first dorsal blotches.

The only exception in terms of this diagnosis and as part of the diagnosis for the nominate subgenus (above), is for specimens without the above mentioned markings, which are in turn separated from other *Caudisona*, including *Smythus* subgen. nov. by a black or dark bar bordered before and after with cream or buff, crossing the head between the anterior points of the supraoculars (namely specimens of *C. totonacus*).

Snakes in the subgenus *Smythus* subgen. nov. do not have the transverse bar in the prefrontal area as just described, the preceding, excluding *C. totonacus*, which is herein also placed within *Smythus* gen. nov..

In *Smythus* subgen. nov. on the neck there are no regular dark stripes, one to three scale rows wide separated by a

single light mid-dorsal stripe two to three scale rows wide, and no stripes extending from one to four head lengths behind the head before they meet the first dorsal blotches, separating *Smythus* subgen. nov. from other *Caudisona*, either alone or when used in combination with any or all other diagnostic information within this paper.

Separation of other *Smythus* subgen. nov. from *C. totonacus* is given above.

Pillotus subgen. nov. is separated from all other *Caudisona* including subgenus *Smythus* subgen. nov. by scales in the internasal and prefrontal area totalling 12 or more as opposed to 12 or less for all other *Caudisona*. Scales in the crown and in the frontal area are rough, ridged and knobby in *Pillotus* (subgen. nov.) *enyo*, as opposed to the same scales being smooth in all other *Caudisona* species.

Klauber 1972, provides keys to further separate the species herein listed under the subgenus *Smythus* subgen. nov.

Etymology: Named after Australian wildlife demonstrator Michael Smyth in honour of his conservation work with our company "Snakebusters – Hand on reptiles" which leads the way in wildlife conservation in Australia. Michael's educational efforts have brought countless people in contact with reptiles and created a whole generation of herpetologists, scientists and conservationists.

Species in subgenus *Smythus* subgen. nov.

C. basiliscus Cope 1864

C. estebanensis (Klauber 1949)

C. molossus (Baird and Girard 1853)

C. totonacus (Gloyd and Kauffeld 1940)

GENUS UROPSOPHUS WAGLER 1830

Type species: *Uropsophus triseriatus* Wagler 1830

Diagnosis: A group of small rattlesnake species found in Mexico and adjacent southern USA.

They are separated from all other rattlesnake genera by the following suite of characters.

The top of the head has scales of various sizes, more than one scale in the frontal area and the parietals, if enlarged are not in contact or symmetrical.

The outer edges of the supraoculars are not extended into raised and flexible hornlike processes that are distinctly pointed at the tip.

Males have less than 40 subcaudals and females less than 35.

The tail has rings which may or may not be distinct, unless the tail is black.

The tip of the snout and the canthus rostralis are not raised into a sharp ridge.

There are no thin, black-bordered transverse lines on the supraoculars; no clearly outlined round or oval blotch below the eye and the intercanthals, if paired aren't long and slim. The mid body scale rows plus the supralabials on both sides of the head total 42 or more.

The nominate form (*triseriatus*) is separated from others in the genus by the fact that the upper preocular isn't split vertically, or if split, the anterior section isn't conspicuously higher than the posterior and not curved over the canthus rostralis in front of the supraocular. The dorsal body blotches occupy more longitudinal space than the interspaces and there are usually more than 24 primary body blotches.

Members of *Uropsophus* can be easily separated from *Aechmophrys* and the herein inclusive subgenus *Cottonus*

subgen. nov. by the presence of prefoveals, usually 23 or more mid body scale rows (versus 21), a relatively larger and broader head and a stouter body (Dorcas 1992, Klauber 1972 and Smith 1946).

For separation from *Aechmophrys*, *Caudisona*, *Crotalus*, *Matteoea*, *Hoserea* and *Cummingea*, see the diagnoses above or below.

Separated from *Sistrurus* and *Piersonus* gen. nov. (described above) by the absence of large head shields at the center of the crown of the head.

Species in genus *Uropsophus*:

U. triseriatus Wagler 1830

U. aquilus (Klauber 1952)

U. lepidus (Kennicott 1861)

U. pusillus (Klauber 1908)

CUMMINGEA GEN NOV.

Type species: *Crotalus stejnegeri* Dunn 1919

Diagnosis: Separated from all other rattlesnake genera by the following suite of characters.

The top of the head has scales of various sizes, more than one scale in the frontal area and the parietals, if enlarged are not in contact or symmetrical.

The outer edges of the supraoculars are not extended into raised and flexible hornlike processes that are distinctly pointed at the tip.

The simplest diagnostic trait of *Cummingea* gen. nov. is that there are more than 40 subcaudals in males and more than 35 in females. In all other rattlesnakes, there are fewer than 40 subcaudals in males and fewer than 35 in females.

In common with larger rattlesnakes, snakes in this genus also have a high number of ventral scales as compared to other small montane rattlesnake species.

All are slender in habit and moderate in size (50-75 cm), canthals not in contact at dorsal midline, separated by 1-3 scales.

The description by Dunn 1919 for the species *stejnegeri* also serves as an excellent description for the genus *Cummingea* gen. nov., noting that at the time of his description the other two species in the genus were not known to science. He wrote: "A small *Crotalus* with a long slender tail, a very small rattle with the first pair of lower labials long and produced backwards broadly in contact behind the symphyisial". Obviously The word "*Crotalus*" should be substituted with the word "rattlesnake" to make the diagnosis for *Cummingea* gen. nov. accurate and relevant and for the purpose of this description, the sentence is repeated here with the correction:

"A small Rattlesnake with a long slender tail, a very small rattle with the first pair of lower labials long and produced backwards broadly in contact behind the symphyisial."

In all *Cummingea* the rostral is wider than high.

For further separation from *Aechmophrys*, *Uropsophus*, *Caudisona*, *Crotalus*, *Matteoea*, and *Hoserea*, see the diagnoses above or below.

Separated from *Sistrurus* and *Piersonus* gen. nov. (described above) by the absence of large head shields at the center of the crown of the head.

Etymology: In honour of leading Australian journalist Fia Cumming, who over a 20 year period was often the only news reporter employed with the mainstream media with the courage to take on the corruption and lies from government

officials who sought to outlaw all private ownership of reptiles in Australia.

Without her efforts, including her being the first and main reporter to break the news story of the illegal banning of the book *Smuggled: The Underground Trade in Australia's Wildlife* (Hoser 1993) in May 1993, there would be no person in Australia allowed to have contact with reptiles in any way, save for a handful of privileged persons in government run zoos and the like.

That was the legal situation in most of Australia before the publication of the *Smuggled* books in 1993 and 1996 (Hoser 1993, 1996).

See also for *Piersonus* gen. nov. above.

Species in genus *Cummingea* gen. nov.

C. stejnegeri (Dunn 1919)

C. ericsmithi (Campbell and Flores-Villella 2008)

C. lannomi (Tanner 1966)

HOSEREA GEN. NOV.

Type species: *Crotalus atrox* Baird and Girard 1853

Diagnosis: Separated from other rattlesnakes by the following characteristics (this diagnosis) either individually and/or in any combination, including or excluding by reference to the diagnoses for any of the other genera of rattlesnakes herein (this paper) (alone and/or in any combination) and/or including or excluding the diagnoses for the component species as listed herein, via reference to the texts of Klauber (1972) (taxa may be identified as subspecies within), or Campbell and Lamar (2004).

Hoserea gen. nov. are generally large species and include the largest recorded living rattlesnakes recorded since European settlement, with *H. adamanteus* being quoted as exceeding 180 cm in total length and *H. atrox* being recorded at slightly lesser lengths.

Records above this length are usually doubtful or exaggerated.

Also see Jones, (1997).

However Klauber (1972) and others do quote larger measurements for these taxa.

The top of the head has scales of various sizes, more than one scale in the frontal area and the parietals, if enlarged are not in contact or symmetrical.

The outer edges of the supraoculars are not extended into raised and flexible hornlike processes that are distinctly pointed at the tip.

Males have less than 40 subcaudals and females less than 35.

All *Hoserea* gen. nov. are separated from other rattlesnakes by their tail markings. In the case of *Hoserea*, there are distinct thickened dark and light cross-bands of similar width, which are separate from the rest of the snake's dorsal markings, giving the tail a cocoon-like appearance. This bold patterning in this manner is not seen in other rattlesnakes, excluding in *Caudisona*, whose differentiating characters are given below.

Hoserea gen. nov. are also identified by having a body pattern of diamonds, hexagons and similar blotches as opposed to crossbands. These are bordered by rows of lighter scale colour.

Another diagnostic for the genus is that the line markings on the face run up at a sharp 45 degree angle, the angle of

which exceeds that of other rattlesnake genera, excluding *Crotalus* (as diagnosed above), noting the differences between *Crotalus* and *Hoserea* gen. nov. as given here and elsewhere in this paper.

However *Crotalus* (as diagnosed above) is separated from this genus (*Hoserea* gen. nov.) by the tail markings which merge into the dorsal patterning anterior to this, as opposed to being of a distinct and separate cocoon-like appearance and not related to the body pattern.

This only applies to subgenus *Sayersus* subgen. nov. (as diagnosed here) as for the remaining *Crotalus* (namely *horridus* only), there are of course no obvious tail crossbands as the tail is invariably black or near black in colour and without obvious banding.

The species *atrox* is separated from all others in the genus *Hoserea* by the following suite of characters. Above, it is grey, brown or pink with brown diamond or hexagonal blotches on the back and fainter smaller blotches on the side. Markings are usually indistinct and peppered with small but distinct dark spots, giving a dusty or speckled appearance, (but not "mite phase" as seen in the genus *Matteoea* gen. nov. as described in this paper).

There are 25 mid body scale rows, rarely 23 or 27, five or less scales between the supraoculars and it is rare for the first infralabials to be transversely divided.

Snakes of the genus *Caudisona* are defined and separated from *Hoserea* gen. nov. as follows.

The top of the head has scales of various sizes, more than one scale in the frontal area and the parietals, if enlarged are not in contact or symmetrical.

The outer edges of the supraoculars are not extended into raised and flexible hornlike processes that are distinctly pointed at the tip.

Males have less than 40 subcaudals and females less than 35.

Prenasals contact the rostral. The body pattern comprises diamonds, hexagons, rectangles or ellipses, or if bands, not made up of conspicuous dots; dorsoventral width of the proximal rattle in the head length more than two and a half times. The anterior subocular fails to reach any supralabial. There are two internasals only. The upper preocular is not split vertically, or if split the anterior section is not conspicuously higher than the posterior and not curved over the canthus rostralis in front of the supraocular, dorsal body blotches occupy more longitudinal space than the interspaces, and the pattern of diamonds, hexagons, rectangles or ellipses usually exceeds 24 in number.

There are more than 164 ventrals.

Tail rings are indistinct or absent. There are usually four or less often six or more large flat scales occupying the internasal/prefrontal area and not including the subcanthals or supralorals.

The species *Hoserea atrox* is separated from the similar in appearance *H. ruber*, by the fact that *H. ruber* has a more reddish colouration, less distinct markings and the first lower labial is divided transversely.

All other *Hoserea* species, excluding *H. tortugensis*, but including *ruber* and *adamanteus* have been assigned to other subgenera, namely *Edwardsus* subgen. nov., *Mullinsus* subgen. nov., and *Crutchfieldus* subgen. nov.. They are further in turn separated from *H. atrox* by the diagnoses within those descriptions within this paper and incorporated herein as part of this genus diagnosis.

The diagnosis for *H. atrox* as given in keys and elsewhere in Klauber (1972) for "*Crotalus atrox*" also applies to the taxon.

H. tortugensis remains in the *Hoserea* subgenus nov. and is diagnosed as for *H. atrox* above save for what follows.

It is however separated from *H. atrox* by the fact that the upper preocular is not in contact with the postnasal and there is no loreal present. In *H. atrox*, the upper preocular is generally in contact with the postnasal and/or such contact is prevented by an upper loreal. The taxon *H. tortugensis* is known only from Isla Tortuga located in the Gulf of California. Isla Tortuga is the remnant of a volcano. The island's landscape is dry and barren.

Castoe et. al. 2006, suggest that *H. tortugensis* (named in their paper as *Crotalus tortugensis*) should be placed in synonymy with *H. atrox*. This placement is based on DNA evidence, phylogeny and also their definition of "species", the latter not clearly defined in their paper.

Regardless of the placement of the taxon, it is clear that *tortugensis* is most closely affiliated with *atrox*, in terms of the rattlesnakes (see also Klauber 1972).

While this paper treats *H. tortugensis* as a full species (as seems to be the case for most herpetologists in terms of this taxon as of the period 1998-2012), it is my view that the current evidence suggests that subspecies is in fact a more appropriate definition.

The subspecies level treatment of the taxon is also more in line with the current views in Australia for taxa isolated in similar circumstances, most notably being those in the genus *Notechis* (see Keogh et. al. (2004) and reference sources therein).

Similar applies for the *H. atrox* taxon, from Santa Cruz Island in the Gulf of California.

Some authors have listed it as a species-level taxon (Murphy et. al. 2002), while others have treated it as synonymous with *H. atrox* (Castoe et. al. 2006).

Regardless as to the placement of the taxon at the species level, it will readily be identified as being of the genus *Hoserea* gen. nov. and nominate subgenus *Hoserea* when the genus is in turn subdivided. Likewise applies in the event that the eastern and western clades of *H. atrox* are split, based on their recent (in geological terms) phylogenetic history, notwithstanding recent evidence of gene flow between the clades.

All are treated as *H. atrox* for the purposes of this paper.

For further separation from *Aechmophrys*, *Uropsophus*, *Caudisona*, *Crotalus*, *Matteoea*, and *Cummingea*, see the diagnoses above or below.

Separated from *Sistrurus* and *Piersonus* gen. nov. (described above) by the absence of large head shields at the center of the crown of the head.

Etymology: In honour of my wife, Shireen Hoser who must put up with myself with all imperfections (there's not too many) and long absences for a whole host of matters, herpetological and otherwise and also for untold assistances in terms of running "Snakebusters", Australia's best known wildlife rescue business and the first company in Australia to be licenced to remove so-called nuisance snakes, which prior to my receipt of such a licence in 1982, were always killed on site. Even as of 2009, most Australians think that the best snake is a dead one and it is a sad fact that Australia's wildlife conservation record is absolutely abysmal.

As recently as late 2008 at a VCAT (Tribunal) hearing the head of the (Australian) Victorian Wildlife Department's

licencing branch (DSE, WAGLS), Mr Ron Waters, told the tribunal that he was happy to see licenced snake catchers go to houses and kill snakes, including by using metal "snake tongs". This he has repeated a number of times including at a VCAT tribunal hearing in 2012.

Interstate counterparts have expressed similar views.

Unfortunately the attitude of Ron Waters is typical of wildlife bureaucrats in Australia and also reflected by a sizeable chunk of the general public who are unfortunately educated by the government and the money they spend on "information" (sometimes better described as propaganda). This view has also been upheld by two snake-hating Judges at the Victorian Government tribunal called VCAT, the judges names being Anne Coghlan and Pamela Jenkins.

Species in genus *Hoserea* gen. nov.

H. atrox (Baird and Girard 1853)

H. tortugensis (Van Denburgh and Slevin 1921)

Species in the subgenus *Edwardsus* subgen. nov.

H. adamanteus (Beauvois 1799)

Species in the subgenus *Mullinsus* subgen. nov.

H. ruber (Cope 1892)

H. exsul (Garman 1883)

H. lorenzoensis (Radcliffe and Maslin 1975)

Species in the subgenus *Crutchfieldus* subgen. nov.

H. catalinensis (Cliff 1954)

EDWARDSUS SUBGEN. NOV.

Type species: *Crotalus adamanteus* Beauvois 1799

Diagnosis: At the present time, *Edwardsus* subgen. nov. is monotypic with only one taxon within, namely *H. adamanteus*.

While the diagnosis for *Hoserea* (above) and *Mullinsus* subgen. nov. below applies to this subgenus, the following separates this subgenus from *H. atrox*.

This species *E. adamanteus* the only taxon in this subgenus is the largest species of rattlesnake in the world. Fossils attributable to this taxon are also believed to be from specimens larger than those in existence today.

The taxon is easily separated from *Hoserea atrox* by its dorsal patterning. For *adamanteus*, it is a distinctive row of diamonds running along the spinal ridge, with each dark area separated by thinner white edges, over a mid-shade background.

For *H. atrox*, the patterning is far less distinct (see also *Mullinsus* subgen. nov. below). Also see the diagnosis for *H. atrox* above.

In *H. adamanteus*, the upper pre-ocular is not split vertically or if split, the anterior section is not conspicuously higher than the posterior and not curved over the canthus rostralis in front of the supraocular.

There is a vertical light line (sometimes slightly triangular) on the posterior edges of the prenasals and first supralabials in *H. adamanteus*. These are not present in *H. atrox*, *H. tortugensis*, any other *Hoserea*, or any other rattlesnakes except (occasionally) for those in the genera *Sistrurus* and *Piersonus* gen. nov., both readily identifiable (and separated from *Hoserea*) by their large symmetrically placed enlarged shields (usually nine) arranged in the middle of the head.

The diagnosis for *H. adamanteus* as given in keys and elsewhere in Klauber (1972) for "*Crotalus adamanteus*" also applies to the taxon.

Crutchfieldus subgen. nov. is separated from all other rattlesnakes by the fact that the rattle matrix is shrunken. There is no loose rattle segment.

That subgenus is endemic to Isla Santa Catalina, Mexico.

Etymology: In honour of Queensland, Australia-based Euan Edwards for his many contributions to herpetology in Australia, Madagascar, the USA and elsewhere.

Species in the subgenus *Edwardsus* subgen. nov.

H. adamanteus (Beauvois 1799)

MULLINSUS SUBGEN. NOV.

Type species: *Crotalus ruber* Cope 1892

Diagnosis: While the diagnosis for *Hoserea* gen. nov. (above) and *Edwardsus* subgen. nov. as applicable above applies to this subgenus, the following separates this subgenus from *H. atrox*, *H. tortugensis* and *H. adamanteus*.

In the subgenus *Mullinsus* subgen. nov. the first pair of lower labials are divided transversely. This separates the taxa within the subgenus from *Hoserea atrox*, *H. adamanteus* and *H. tortugensis*.

All taxa within *Mullinsus* gen. nov. have a distinct white marking on the scales of the upper labials more or less between the eye and the nostril. Instead of being in the form of an upward facing diamond or line as seen in other rattlesnakes, it presents as a partly broken diamond shape, with the anterior point flattened out and the posterior pointing towards the eye.

Crutchfieldus subgen. nov. (a monotypic subgenus containing the taxon *H. catalinensis*) is separated from all other rattlesnakes by the fact that the rattle matrix is shrunken. There is no loose rattle segment. That subgenus is endemic to Isla Santa Catalina, Mexico.

Etymology: Named after Australian wildlife demonstrator Dylan Mullins in honour of his conservation work with our company "Snakebusters – Handle the animals" which leads the way in wildlife conservation in Australia, doing reptile shows that let people "hold the animals". Dylan's educational efforts have brought countless people in contact with reptiles and created a whole generation of herpetologists, scientists and conservationists.

Species in the subgenus *Mullinsus* subgen. nov.

H. ruber (Cope 1892)

H. exsul (Garman 1883)

H. lorenzoensis (Radcliffe and Maslin 1975)

CRUTCHFIELDUS SUBGEN. NOV.

Type species: *Crotalus catalinensis* Cliff 1954

Diagnosis: While the diagnosis for *Hoserea* (above) and other relevant subgenera as also named herein applies to this subgenus, the following separates this subgenus from other *Hoserea* and for that matter all other rattlesnakes.

This subgenus is separated from all other rattlesnakes by the fact that the rattle matrix is shrunken. There is no loose rattle segment.

It is endemic to Isla Santa Catalina, Mexico.

Etymology: Named after herpetologist, breeder and dealer, Tom Crutchfield, mainly based in Florida, USA, for his many contributions to herpetology.

Species in the subgenus *Crutchfieldus* subgen. nov.

H. catalinensis (Cliff 1954)

MATTEOEA GEN. NOV.

Type species: *Caudisona mitchellii* Cope 1861

Diagnosis: A group of small rattlesnakes, (adults well under 100 cm in length).

The top of the head has scales of various sizes, more than one scale in the frontal area and the parietals, if enlarged are not in contact or symmetrical.

The outer edges of the supraoculars are not extended into raised and flexible hornlike processes that are distinctly pointed at the tip.

Males have less than 40 subcaudals and females less than 35.

The tip of the snout and the anterior canthus rostralis is not raised into a sharp ridge.

These snakes are highly rugose rattlesnakes, separated from other rattlesnakes by distinct salt and pepper markings across the dorsal surface, often giving the appearance of mite faeces, and otherwise described as a "mite phase". This is especially so for *M. mitchellii*, but also applies to others in the genus, namely *M. tigris* and *M. angelensis*. All three taxa are separated from all other rattlesnakes by their distinctive crossband pattern.

These snakes also have small scales between the rostral and prenasals. The supraoculars are pitted and creased.

Compared to other rattlesnakes the head is smallish and the rattle large (note this combination).

M. tigris is separated from other *Matteoea* gen. nov. by the fact that the prenasals contact the rostral (it doesn't in *M. mitchellii* and *M. angelensis*).

All snakes in the genus *Matteoea* gen. nov. have a body pattern of 35 or more crossbands on a buff, pink or grey background.

For separation from *Aechmophrys*, *Uropsophus*, *Caudisona*, *Crotalus*, *Hoserea*, and *Cummingea*, see the diagnoses elsewhere in this paper.

Separated from *Sistrurus* and *Piersonus* gen. nov. (described above) by the absence of large head shields at the center of the crown of the head.

The taxon referred to here as *M. mitchellii* clearly consists of more than one species, (see for example Douglas et al. 2007 or Grismer 2002). However they are not identified here separately pending further research on the species group, including all currently named subspecies.

Etymology: In honour of Cathryn Matteo, a close personal friend, with no direct interest in herpetology, but whom over 20 years has provided untold and immense assistance's in all kinds of projects the net result including there being a legal regime in most parts of Australia, whereby as of 2009 most people can legally obtain, keep and study reptiles.

Species in genus *Matteoea* gen. nov.

M. mitchellii (Cope 1861)

M. angelensis (Klauber 1963)

M. tigris (Kennicott 1859)

IN EVENT OF CONFLICT OF NAMES (RATTLESNAKES)

In the event of any name conflicts arising as a result of findings by other researchers and any "first revisor" issues that may arise in terms of nomenclature and current ICZN rules and codes the following should be adopted specifically with reference to the names used herein.

As a formality, I should note that, if there is a conflict in that two names assigned herein are designated and "available"

for a given genus group as redefined by a later worker or author, the order of priority should always be as follows: Genus name should always take priority and precedence over a subgenus name.

Within each group, the order of rank or priority in event of conflict herein should be as follows: For genus it is: *Hoserea*, *Cummingea*, *Piersonus*, *Matteoa*. For those names at the subgenus level the order of priority should be: *Sayersus*, *Edwardsus*, *Cottonus*, *Smythus*, *Rattlewellsus*, *Pillotus*, *Mullinsus*, *Crutchfieldus*.

NEW WORLD CORAL SNAKES, GENUS *MICRURUS*, WAGLER 1824

Within the Tribe Elapini Boie 1827, are the new world coral snakes.

These are the only elapid snakes in the Americas.

These are snakes characterized by hollow, fixed fangs at the front of the mouth through which they inject venom.

Therefore on close inspection they can't be confused with other local New World species due to their distinctive pteroglyph venom apparatus, as well as their distinctive shiny smooth scales and generally cylindrical build.

These new world snakes are invariably gaudily ringed with red, black and yellow and are most numerous in central and south America both in terms of abundance and abundance of species.

While all were for many years placed in the single genus *Micrurus*, some quite divergent taxa have been since moved to other erected genera.

On inspection, Schmidt removed the taxon *euryxanthus* (Kennicott 1861) from the genus *Micrurus* in 1928 on the basis of colour and lepidosis (hemipene morphology). That taxon remains the sole member of the genus *Micruroides* Schmidt 1928.

In 1937 Schmidt was the first to recognise that two South American species of coral snake differed in having the first pair of infralabials reduced in size and failing to meet along the ventral midline, thus permitting contact of the mental with the anterior pair of chinshields. These slender coral snakes also had a distinctive colour pattern of whitish, yellow or red ventral spots on an otherwise uniformly black body, leading him to place them in the genus *Leptomicrurus* Schmidt, 1937.

Slowinski (1995) synonymised *Leptomicrurus* with *Micrurus* because he found it's phylogeny rooted with *Micrurus*, however more recent workers including Campbell and Lamar (2004) have rejected this merger of genera.

Since then, the remaining morphologically conservative species within the ever increasing in size genus *Micrurus* have remained grouped within this genus.

That there has been no dissent among taxonomists is astounding as it is patently clear on many grounds that the group must be paraphyletic at the genus level, even if by means of crude assessment of the geological and distributional evidence.

Campbell and Lamar (2004), quite adequately split the genus as recognised into two main groups based on hemipene characteristics, a split that has been noted by later authors, including for example O'Shea (2005).

The first group, he called the "Monadal Group", based on their colouration, (those patterned with a single black band between each pair of red bands, i.e. red/yellow/black/yellow/red) which included two additional species he included in a so-called "Central American Triad Bearing Group" of different

colouration, but similar hemipenal morphology as well as a group of several South American species in which accessory black rings are sometimes present (the bicoloured group).

Clearly this major group warrants recognition at the genus level and this is done here.

The new genus *Hoserelapidea* gen. nov. is then subdivided three ways, including the nominate subgenus (*Hoserelapidea* subgen. nov.).

The two species in the "Central American Triad Bearing Group" are placed in a new subgenus herein, namely *Binghamus* subgen. nov. as they do not appear to be related from the lower Central American and South American "Triad coral snakes", which remain in the genus *Micrurus*.

The group of several South American species in which accessory black rings are sometimes present (the so-called "bicoloured group") are placed in a new subgenus (of *Hoserelapidea* gen nov.) namely *Troianous* subgen. nov..

Triad coral snakes, those remaining in *Micrurus*, are those patterned with three black rings between each pair of red rings, (i.g. red/black/yellow/black/yellow/black/red).

It should be noted that some very recently described taxa placed within the (broadly interpreted) genus *Micrurus* have been ignored in terms of this paper. However all can be readily assigned to the genera and/or subgenera diagnosed herein on the basis of the characters given.

HOSERELAPIDEA GEN. NOV.

Type species: *Micrurus fulvius* (Linnaeus, 1766) originally described as *Coluber fulvius* Linnaeus, 1766.

Diagnosis: A group of coral snakes differentiated from those (remaining) in genus *Micrurus* by hemipenal morphology; this group includes the species with mondal black rings (including *M. fulvius*) as well as the two species with triads found in Mexico and Guatemala (*elegans* and *laticollaris*); and several South American species in which accessory black rings are sometimes present, all have hemipenes that closely resemble those of genus *Micruroides*; members of this group of snakes have long, slender, strongly bifurcate organs that extend from 8 to 15 subcaudals (up to 19); the length of the lobes is equal to about one third to one half that of the base; a deep, naked furrow extends parallel to the sulcus spermaticus from the base of the organ to the base of a lobe; this furrow is situated dorsomedially when the organ is inverted; in these species the sulcus spermaticus bifurcates at the level of the fifth to tenth subcaudal and extends to the apex of each lobe; each lobe is tapered (strongly attenuate in *browni*), and *fulvius* has spinulate awns that terminate in a papilla; proximally the organ possesses tiny spines (naked on the asulcate side in some species) that gradually increase in size distally; the proximal one-half of each lobe bears long, slender spines that diminish in size toward the apex; the crotch and areas flanking each branch of the sulcus on the proximal position of each lobe are naked.

By contrast members of the other group of coral snakes, including the South American species with a pattern of triads (including the type species for existing genus *Micrurus*, namely *spixii*) have short, rotund, bilobed hemipenes that often extend only about 5-6 subcaudals, but may be as long as 10-11 subcaudals in some species. The lobes are correspondingly short, one fourth to one third the length of the base. The deep, naked furrow so conspicuous in the first group is absent. The sulcus spermaticus is bifurcate and extends to the apices. All but the proximal position of the base of the organ, which has tiny spinules, is covered by moderate-sized, subequal, somewhat flexible spines.

Most species in the widespread genus *Hoserelapidea* gen. nov. have black rings arranged singly in a red-yellow-black-red-yellow-red sequence. A few species depart from this colour pattern and may be only red and black (*bernardi*, *limbatus* and some *nigrocinctus*). *Hoserelapidea* gen. nov. are the dominant group of coral snakes in North and Central America, with many species also found in South America.

Some South American species have melanized patterns in which the red colouration has become strongly or totally obscured. Some populations of otherwise monadal patterned coral snakes have clearly independently evolved a triad pattern in the form of poorly developed accessory black rings (*dumerillii*, *sangilensis*), but they appear to belong in this genus.

The tail is relatively long, at least 11 percent of the total length in males and up to 18-20 percent in species such as *averyi* and *dumerillii*; females have tails that are usually 7-12 percent of the total length.

As already mentioned, the hemipenis in this genus is strongly bilobed and slender with lobes that are distinct from the base.

Etymology: Named in honour of my oldest daughter Adelyn Hoser. In mid 2012, she bravely volunteered to publicly be bitten by our venomous snakes, in this case a Death Adder (*Acanthophis cummingi*) and an Inland Taipan (*Parademansia microlepidota*) to shatter ongoing lies by business rivals and their friends in the government wildlife department, (DSE), who had falsely claimed that the snakes had regenerated venom and were a public safety risk.

Adelyn's bravery didn't relate to the snakes, as they were totally harmless. Instead it came from the inevitable hatred and reprisals that came from the others, now publicly exposed as pathological liars. The DSE officers exposed as liars attacked her at home in a heavily armed 11 man, 9 hour raid, conducted 7 days after the lie busting video was publicly released (the armed raid being on 17 August 2011).

Species in the genus *Hoserelapidea* subgen. nov.

- H. albicinctus* (Amaral 1926)
- H. alleni* (Schmidt 1936)
- H. annellatus* (Peters 1871)
- H. averyi* (Schmidt 1939)
- H. bernadi* (Cope 1887)
- H. bocourti* (Jan 1872)
- H. bogerti* (Roze 1967)
- H. browni* (Schmidt and Smith 1943)
- H. catamayensis* (Roze 1989)
- H. circinalis* (Dumeril and Bibron 1854)
- H. clarki* (Schmidt 1936)
- H. corallinus* (Merrem 1820)
- H. diastema* (Dumeril, Bibron and Bibron 1854)
- H. distans* (Kennicott 1861)
- H. dumerillii* (Jan 1858)
- H. elegans* (Jan 1858)
- H. ephippifer* (Cope 1886)
- H. fulvius* (Linnaeus 1766)
- H. hippocrepis* (Peters 1862)
- H. langsdorffi* (Wagler 1824)
- H. laticollaris* (Peters 1869)
- H. latifasciatus* (Schmidt 1933)
- H. limbatus* (Fraser 1964)
- H. margaritiferus* (Roze 1967)
- H. medemi* (Roze 1967)

- H. mertensi* (Schmidt 1936)
- H. mipartitus* (Dumeril, Bibron and Dumeril 1854)
- H. multifasciatus* (Jan 1858)
- H. multiscutatus* (Rendahl and Vestergren 1940)
- H. nebularis* (Roze 1989)
- H. nigrocinctus* (Girard 1855)
- H. oligoanellatus* (Ayerbe and Lopez 2002)
- H. ornatissimus* (Jan 1858)
- H. pachecogili* (Campbell 2000)
- H. paraensis* (Cunha and Nascimento 1973)
- H. peruvianus* (Schmidt 1936)
- H. petersi* (Roze 1967)
- H. proximans* (Smith and Chrapliwy 1958)
- H. psyches* (Daudin 1803)
- H. putumayensis* (Lancini 1962)
- H. remotus* (Roze 1987)
- H. ruatanus* (Gunther 1895)
- H. sangilensis* (Niceforo-Maria 1942)
- H. spurelli* (Boulenger 1914)
- H. steindachneri* (Werner 1901)
- H. stewarti* (Barbour and Amaral 1928)
- H. stuarti* (Roze 1967)
- H. tener* (Baird and Girard 1853)

BINGHAMUS SUBGEN. NOV.

Type species: *Micrurus elegans* (Jan 1858)

Originally described as *Elaps elegans* Jan 1858

Diagnosis: This subgenus is a phenetic grouping of two known species endemic to Mexico whose triad pattern was apparently derived independently from the monad group of coral snakes consisting the majority of *Hoserelapidea* gen. nov.; both species have distinct triads although individual white rings are reduced to paired transverse series of pale scales in the taxon *elegans*, and both species have relatively long tails; the tail comprises 12-15 percent of the total length in *elegans* males and 8-9 percent of the total length in females; in *laticollaris* the tail comprises 11-13 percent of the total length in males and 10-11 percent of the total length in females; the hemipenes in this group are essentially the same as for the genus *Hoserelapidea* gen. nov.; triad bearing species are unusual in middle America, noting again that both are restricted in distribution to Mexico.

Troianous subgen. nov. snakes are sometimes called the "bicoloured group" of coral snakes and are separated from *binghamus* subgen. nov. snakes by the following: members of that group have body rings of black and orange (red) or black and white; the parietal and tail rings of the black-and-white species may be orange or red-orange; the body form is very elongated and slender for coral snakes with short tails that comprise 6-10 percent of the total length in males and 4-9 percent in females;

Trioanus subgen. nov. snakes have a distribution from Nicaragua in lower central America into South America, which is outside the known range for *binghamus* subgen. nov. species..

By a process of elimination, snakes not conforming to placement within the subgenera *Binghamus* subgen. nov. or *Troianous* subgen. nov. remain within the subgenus *Hoserelapidea* subgen. nov..

All within the genus *Hoserelapidea* gen. nov including these two species within this subgenus have hemipenes that closely resemble those of genus *Micruroides*; members of

this group of snakes have long, slender, strongly bifurcate organs that extend from 8 to 15 subcaudals (up to 19); the length of the lobes is equal to about one third to one half that of the base; a deep, naked furrow extends parallel to the sulcus spermaticus from the base of the organ to the base of a lobe; this furrow is situated dorsomedially when the organ is inverted; in these species the sulcus spermaticus bifurcates at the level of the fifth to tenth subcaudal and extends to the apex of each lobe; each lobe is tapered (strongly attenuate in *browni*), and *fulvius* has spinulate awns that terminate in a papilla; proximally the organ possesses tiny spines (naked on the asulcate side in some species) that gradually increase in size distally; the proximal one-half of each lobe bears long, slender spines that diminish in size toward the apex; the crotch and areas flanking each branch of the sulcus on the proximal position of each lobe are naked.

By contrast members of the other group of coral snakes, those remaining in the genus *Micrurus*, including the South American species with a pattern of triads (including the type species for existing genus *Micrurus*, namely *spixii*) have short, rotund, bilobed hemipenes that often extend only about 5-6 subcaudals, but may be as long as 10-11 subcaudals in some species. The lobes are correspondingly short, one fourth to one third the length of the base. The deep, naked furrow so conspicuous in the first group is absent. The sulcus spermaticus is bifurcate and extends to the apices. All but the proximal position of the base of the organ, which has tiny spinules, is covered by moderate-sized, subequal, somewhat flexible spines.

Etymology: Named in honour of snake handler Jarrod Bingham, who has many credits, including doing 24 hour wildlife rescue in Melbourne. Unlike a number of other snake catchers in Melbourne who use "killer tongs" to catch (and at the same time painfully kill) snakes, Jarrod is able to catch snakes quickly, efficiently and painlessly for the snakes.

Species in subgenus *Binghamus* subgen. nov.

H. elegans (Jan 1858)

H. laticollaris (Peters 1869)

TROIANOUS SUBGEN. NOV.

Type species: *Micrurus mipartitus* (Dumeril, Bibron and Dumeril 1854)

Originally described as *Elaps mipartitus* Dumeril, Bibron and Dumeril 1854

Diagnosis: *Troianus* subgen. nov. snakes are sometimes called the "bicoloured group" of coral snakes because members of this group have body rings of black and orange (red) or black and white; the parietal and tail rings of the black-and-white species may be orange or red-orange; the body form is very elongated and slender for coral snakes with short tails that comprise 6-10 percent of the total length in males and 4-9 percent in females; The hemipenes are strongly bilobed and slender, with lobes that are distinct from the base.

The snakes have a distribution from Nicaragua in lower central America into South America and are separated from *Binghamus* subgen. nov. snakes by distribution, the latter being endemic to Mexico.

The *Binghamus* subgenus is a phenetic grouping of two known species endemic to Mexico whose triad pattern was apparently derived independently from the monad group of coral snakes consisting the majority of *Hoserelapidea* gen. nov.; both species have distinct triads although individual white rings are reduced to paired transverse series of pale

scales in the taxon *elegans*, and both species have relatively long tails; the tail comprises 12-15 percent of the total length in *elegans* males and 8-9 percent of the total length in females; in *laticollaris* the tail comprises 11-13 percent of the total length in males and 10-11 percent of the total length in females; by a process of elimination, snakes not conforming to placement within the subgenera *Binghamus* subgen. nov. or *Troianus* subgen. nov. remain within the subgenus *Hoserelapidea* subgen. nov..

All within the genus *Hoserelapidea* gen. nov including the four species within this subgenus have hemipenes that closely resemble those of genus *Micruroides*; members of this group of snakes have long, slender, strongly bifurcate organs that extend from 8 to 15 subcaudals (up to 19); the length of the lobes is equal to about one third to one half that of the base; a deep, naked furrow extends parallel to the sulcus spermaticus from the base of the organ to the base of a lobe; this furrow is situated dorsomedially when the organ is inverted; in these species the sulcus spermaticus bifurcates at the level of the fifth to tenth subcaudal and extends to the apex of each lobe; each lobe is tapered (strongly attenuate in *browni*), and *fulvius* has spinulate awns that terminate in a papilla; proximally the organ possesses tiny spines (naked on the asulcate side in some species) that gradually increase in size distally; the proximal one-half of each lobe bears long, slender spines that diminish in size toward the apex; the crotch and areas flanking each branch of the sulcus on the proximal position of each lobe are naked.

By contrast members of the other group of coral snakes, those remaining in the genus *Micrurus*, including the South American species with a pattern of triads (including the type species for existing genus *Micrurus*, namely *spixii*) have short, rotund, bilobed hemipenes that often extend only about 5-6 subcaudals, but may be as long as 10-11 subcaudals in some species. The lobes are correspondingly short, one fourth to one third the length of the base. The deep, naked furrow so conspicuous in the first group is absent. The sulcus spermaticus is bifurcate and extends to the apices. All but the proximal position of the base of the organ, which has tiny spinules, is covered by moderate-sized, subequal, somewhat flexible spines.

Etymology: Named in honour Christopher Troiano, a valued staff member at Snakebusters, hold the animals, known widely as Australia's best reptile shows. For many years he has carried out essential education and conservation work in terms of reptiles in the Australian state of Victoria.

His job has been made all the more difficult due to the commercially motivated lies and misinformation peddled by newly licenced and unethical business operators who "compete" in the same space, corruptly aided and abetted by their close friends within the State Government authorities. The attacks have included the sending of thugs to our public displays to create trouble, steal and damage property, attack and steal reptiles and make false complaints.

The situation is made worse here in that those who compete against us also regulate us in what is clearly an improper situation, the main competitor in our space being the dysfunctional government run "Zoos Victoria" encompassing three very poorly run facilities (Melbourne Zoo, Werribee Zoo and Healesville Zoo), in which mistreatment and poor husbandry of animals is endemic, as is the dissemination of false and misleading information.

On 9 March 2012, the Victorian government authority (DSE) (part of the "Zoos Victoria" umbrella) and the government

regulator of Snakebusters, made a false claim that the Snakebusters venomoid snakes had regenerated venom (not possible) and then claimed that Snakebusters were therefore unsafe, leading them to unlawfully cancel my own (Raymond Hoser) operating licences.

As a result they effectively closed down the most successful independent wildlife education business in the state's history. As a result about 1,000 bookings had to be cancelled immediately.

To his credit Christopher Troiano and Michael Laidlaw, in association with (independently licenced) Federico Rossignolli quickly got their own licences independent of myself to allow vitally important Snakebusters education to continue (albeit at a very reduced scale) and for the company to honour a number of pre-booking commitments that were able to be resurrected.

The importance herein is that had these established clients gone and seen the less experienced imitators (their mobile wildlife shows), then they would have been at safety risk, due in part to the consistently wrong and dangerous advice given by these people and equally significantly due to their extremely dangerous public displays of highly venomous elapid snakes without appropriate safety protocols, barriers that fail to comply with government regulations and with snakes that have not been surgically de-venomized.

By way of telling example on 1 April 2012 (yes, April fool's day!) a man followed advice peddled by the inexperienced imitators and their friends in the DSE to the effect that "dry bites" are common from Tiger Snakes and failed to seek treatment after being bitten.

The man had allegedly used tongs to catch the snake at Albanvale in Melbourne's west. After he collapsed, he was rushed to hospital where he remained in a critical condition for some days due to internal blood clots and other complications. He was fortunate not to have died.

In 2011 two other well-known snake handlers, including Aleta Stacey of the USA, died from snakebites after receiving false advice from Snakebusters competitors that "dry bites" from venomous snakes are common and happen most of the time. It was reported in the media, that Stacey had received this advice from anti-venomoid campaigner Al Coritz, who also posts various bits of tripe on the internet under various names including "Viperkeeper".

The false "dry bite" claims are part of the elaborate hoax being peddled to the effect that venomoid snakes are a public safety risk. The dry bite claim is raised to enable an explanation of the situation whereby myself and others can sustain numerous bites, with no ill effect, while the claim is maintained that they have regenerated venom and therefore are a public safety risk (the claim being that I am extremely fortunate to have had a few hundred venomous venomoid bites and all have been "dry bites", even though the snakes must have regenerated venom).

The exact same claims are peddled on "Wikipedia" and other internet sites edited by Wolfgang Wüster and others, where they appear credible, are widely believed and continue to put people at risk.

Species in subgenus *Troianus* subgen. nov.

H. mipartitus (Dumeril, Bibron and Dumeril 1854)

H. multifasciatus (Jan 1858)

H. multiscutatus (Rendahl and Vestergren 1940)

H. spurelli (Boulenger 1914)

HOSERELAPIDEA SUBGEN. NOV.

Type species: *Micrurus fulvius* (Linnaeus, 1766)

Originally described as *Coluber fulvius* Linnaeus, 1766.

Diagnosis: As for genus *Hoserelapidea* (see above).

Separated from subgenera *Binghamus* subgen. nov. and *Troianus* subgen. nov. by the following:

Troianus gen. nov. snakes are sometimes called the "bicoloured group" of coral snakes because members of this group have body rings of black and orange (red) or black and white; the parietal and tail rings of the black-and-white species may be orange or red-orange; the body form is very elongated and slender for coral snakes with short tails that comprise 6-10 percent of the total length in males and 4-9 percent in females; The hemipenes are strongly bilobed and slender, with lobes that are distinct from the base.

The snakes have a distribution from Nicaragua in lower central America into South America and are separated from *Binghamus* subgen. nov. snakes by distribution, the latter being endemic to Mexico.

The *Binghamus* subgenus is a phenetic grouping of two known species endemic to Mexico whose triad pattern was apparently derived independently from the monad group of coral snakes consisting the majority of *Hoserelapidea* gen. nov.; both species have distinct triads although individual white rings are reduced to paired transverse series of pale scales in the taxon *elegans*, and both species have relatively long tails; the tail comprises 12-15 percent of the total length in *elegans* males and 8-9 percent of the total length in females; in *laticollaris* the tail comprises 11-13 percent of the total length in males and 10-11 percent of the total length in females; by a process of elimination, snakes not conforming to placement within the subgenera *Binghamus* subgen. nov. or *Troianus* subgen. nov. remain within the subgenus *Hoserelapidea* subgen. nov..

All within the genus *Hoserelapidea* gen. nov including the species within this subgenus have hemipenes that closely resemble those of genus *Micruroides*; members of this group of snakes have long, slender, strongly bifurcate organs that extend from 8 to 15 subcaudals (up to 19); the length of the lobes is equal to about one third to one half that of the base; a deep, naked furrow extends parallel to the sulcus spermaticus from the base of the organ to the base of a lobe; this furrow is situated dorsomedially when the organ is inverted; in these species the sulcus spermaticus bifurcates at the level of the fifth to tenth subcaudal and extends to the apex of each lobe; each lobe is tapered (strongly attenuate in *browni*), and *fulvius* has spinulate awns that terminate in a papilla; proximally the organ possesses tiny spines (naked on the asulcate side in some species) that gradually increase in size distally; the proximal one-half of each lobe bears long, slender spines that diminish in size toward the apex; the crotch and areas flanking each branch of the sulcus on the proximal position of each lobe are naked.

By contrast members of the other group of coral snakes, those remaining in the genus *Micrurus*, including the South American species with a pattern of triads (including the type species for existing genus *Micrurus*, namely *spixii*) have short, rotund, bilobed hemipenes that often extend only about 5-6 subcaudals, but may be as long as 10-11 subcaudals in some species. The lobes are correspondingly short, one fourth to one third the length of the base. The deep, naked furrow so conspicuous in the first group is absent. The sulcus spermaticus is bifurcate and extends to the apices. All but the proximal position of the base of the organ, which has tiny spinules, is covered by moderate-sized, subequal, somewhat flexible spines.

Etymology: Named in honour of the author's daughter Adelyn Hoser (see for genus).

Species in subgenus *Hoserelapidea* subgen. nov.

- H. albicinctus* (Amaral 1926)
H. alleni (Schmidt 1936)
H. annellatus (Peters 1871)
H. averyi (Schmidt 1939)
H. bernadi (Cope 1887)
H. bocourti (Jan 1872)
H. bogerti (Roze 1967)
H. browni (Schmidt and Smith 1943)
H. catamayensis (Roze 1989)
H. circinalis (Dumeril and Bibron 1854)
H. clarki (Schmidt 1936)
H. corallinus (Merrem 1820)
H. diastema (Dumeril, Bibron and Bibron 1854)
H. distans (Kennicott 1861)
H. dumerilii (Jan 1858)
H. ephippifer (Cope 1886)
H. fulvius (Linnaeus 1766)
H. hippocrepis (Peters 1862)
H. langsdorffi (Wagler 1824)
H. latifasciatus (Schmidt 1933)
H. limbatus (Fraser 1964)
H. margaritiferus (Roze 1967)
H. medemi (Roze 1967)
H. mertensi (Schmidt 1936)
H. nebularis (Rose 1989)
H. nigrocinctus (Girard 1855)
H. oligoanellatus (Ayerbe and Lopez 2002)
H. ornatissimus (Jan 1858)
H. pachecogili (Campbell 2000)
H. paraensis (Cunha and Nascimento 1973)
H. peruvianus (Schmidt 1936)
H. petersi (Roze 1967)
H. proximans (Smith and Chrapliwy 1958)
H. psyches (Daudin 1803)
H. putumayensis (Lancini 1962)
H. remotus (Roze 1987)
H. ruatanus (Gunther 1895)
H. sangilensis (Niceforo-Maria 1942)
H. steindachneri (Werner 1901)
H. stewarti (Barbour and Amaral 1928)
H. stuarti (Roze 1967)
H. tener (Baird and Girard 1853)

GENUS *MICRURUS*, WAGLER 1824

Type species: *Micrurus spixii* Wagler 1824

(New) Diagnosis: Members of this other group of coral snakes, including the South American species with a pattern of triads (including the type species for existing genus *Micrurus*, namely *spixii*) have short, rotund, bilobed hemipenes that often extend only about 5-6 subcaudals, but may be as long as 10-11 subcaudals in some species. The lobes are correspondingly short, one fourth to one third the length of the base. The deep, naked furrow so conspicuous in the other genera of coral snakes formerly placed within this genus is absent. The sulcus spermaticus is bifurcate and extends to the apices. All but the proximal position of the base of the organ, which has tiny spinules, is covered by

moderate-sized, subequal, somewhat flexible spines.

The other coral snakes formerly placed in genus *Micrurus* are separated from *Micrurus* by hemipenal morphology; this group described herein as *Hoserelapidea* gen. nov. includes the species with monadal black rings as well as the two species with triads found in Mexico and Guatemala (*elegans* and *laticollaris*); and several South American species in which accessory black rings are sometimes present, all have hemipenes that closely resemble those of genus *Micruroides*; members of this group of snakes have long, slender, strongly bifurcate organs that extend from 8 to 15 subcaudals (up to 19); the length of the lobes is equal to about one third to one half that of the base; a deep, naked furrow extends parallel to the sulcus spermaticus from the base of the organ to the base of a lobe; this furrow is situated dorsomedially when the organ is inverted; in these species the sulcus spermaticus bifurcates at the level of the fifth to tenth subcaudal and extends to the apex of each lobe; each lobe is tapered (strongly attenuate in *browni*), and fulvius has spinulate awns that terminate in a papilla; proximally the organ possesses tiny spines (naked on the asulcate side in some species) that gradually increase in size distally; the proximal one-half of each lobe bears long, slender spines that diminish in size toward the apex; the crotch and areas flanking each branch of the sulcus on the proximal position of each lobe are naked.

Most species in the widespread genus *Hoserelapidea* gen. nov. have black rings arranged singly in a red-yellow-black-red-yellow-red sequence. A few species depart from this colour pattern and may be only red and black (*bernadi*, *limbatus* and some *nigrocinctus*). *Hoserelapidea* gen. nov. are the dominant group of coral snakes in North and Central America, with many species also found in South America.

Some South American species have melanized patterns in which the red colouration has become strongly or totally obscured. Some populations of otherwise monadally patterned coral snakes have clearly independently evolved a triad pattern in the form of poorly developed accessory black rings (*dumerilii*, *sangilensis*), but they appear to belong in this genus.

The tail is relatively long, at least 11 percent of the total length in males and up to 18-20 percent in species such as *averyi* and *dumerilii*; females have tails that are usually 7-12 percent of the total length.

As already mentioned, the hemipenis in the genus *Hoserelapidea* gen. nov. is strongly bilobed and slender with lobes that are distinct from the base.

Etymology: Derives from the Greek *mikros*, meaning "small" and *oura*, meaning "tail", with reference to the short tail in these snakes.

Species within genus *Micrurus* (as defined herein)

- M. altirostris* (Cope 1860)
M. ancoralis (Jan 1872)
M. baliocoryphus (Cope 1860)
M. brasiliensis (Roze 1967)
M. decoratus (Jan 1858)
M. diana (Roze 1983)
M. dissoleucus (Cope 1860)
M. filiformis (Gunther 1859)
M. frontalis (Dumeril, Bibron and Dumeril 1854)
M. hemprichii (Jan 1858)
M. ibiboboca (Merrem 1820)
M. isozonus (Cope 1860)

M. lemniscatus (Linnaeus 1758)
M. meridensis (Roze 1989)
M. pyrrhocryptus (Cope 1862)
M. serranus (Harvey, Aparicio-E and Gonzalez-A 2003)
M. spixii (Wagler 1824)
M. surinamensis (Cuvier 1817)
M. tschudii (Jan 1858)

IN EVENT OF CONFLICT OF NAMES (CORAL SNAKES)

In the event of any name conflicts arising as a result of findings by other researchers and any "first revisor" issues that may arise in terms of nomenclature and current ICZN rules and codes the following should be adopted specifically with reference to the names used herein.

As a formality, I should note that, if there is a conflict in that two names assigned herein are designated and "available" for a given genus group as redefined by a later worker or author, the order of priority should always be as follows: Genus name should always take priority and precedence over a subgenus name.

For those names assigned herein at the subgenus level the order of priority should be: *Binghamus*, *Troianous*.

SUMMARY AND END COMMENTS

Based on recent reclassifications of other reptile groups and the undisputed evidence of phylogeny of the rattlesnakes as detailed in the papers cited herein, the group arrangement of rattlesnakes as described herein is simply a statement of the obvious.

It also is a different arrangement in terms of nomenclature to all previous published to date.

Likewise for the above reclassification of the traditional genus *Micrurus* (although the comments below relate more to the rattlesnakes).

I do not by any stretch of the imagination claim to be the first to group known rattlesnakes into distinct subgroups for which genus level classification is the obvious next step.

Amazingly however, I do herein claim to be the first to actually take that logical step and define and name the main genera of rattlesnakes, beyond the now antiquated "catch all" genus "*Crotalus*", effectively abandoned here (excluding taxa remaining in the genus).

The division of rattlesnakes into just nine genera is in fact very conservative in terms of modern classification methods and taxonomy.

In reality, the 17 named genera model, incorporating the seven named subgenera, elevated subsequently to be full genera, may be the consensus position of most herpetologists some decades from now.

Rather than naming all 16 groups as genus level, I have taken the most conservative position possible, while allowing for a consistent position in terms of defining the various main groups of rattlesnakes at the genus level.

The delineation of the main groups, largely reflective of the evidence as tabled in Murphy et. al. (2002), at the genus level in this paper effectively names all major groups based on earliest divergences.

Secondarily divergent groups have been named at the subgenus level, so as to allow future workers the option of continuing the conservative arrangement herein, or if so inclined to elevate the subgenera to full genus level.

Rather than having this happen at an ad-hoc basis within given groups, I have dealt with all rattlesnakes globally to

keep matters consistent and for the benefit of other herpetologists working on one or more groups of rattlesnakes.

An advantage of the process within this paper is that evident affinities between subgroups remain identified, while allowing all obvious subgroups to have valid names.

The genera and subgenera as defined herein can be reasonably inferred to have been separate groups for a long time. In the case of the genera defined and based on the references cited, it can be reasonably inferred that all have been separated from one another for at least ten million years.

By way of example Quijada-Mascarenas and Wüster 2006 claim a 13 million year divergence between *Caudisona* (as defined herein) and *Smythus* subgen. nov. as defined here, making the designation at the subgenus level conservative indeed.

By any reasonable stretch, this time span allows for differentiation at the genus level, making this name available in the event this becomes the consensus position later.

The results of Murphy et. al. 2002 show that for other herein named generic groups the divergence almost certainly well predates the 13 million year figure for the *Caudisona*/*Smythus* split.

Referring to the species taxon *ravus*, it is clear from the molecular evidence, that short of lumping all former *Sistrurus* and *Crotalus* into a single genus, there is absolutely no realistic alternative but to place the taxon in another genus, herein named *Piersonus* gen. nov.

For the lay person, I can simply compare the current taxonomy and nomenclature of the great apes (defined herein as Humans, Chimpanzees, Gorillas and Orang-utans) and the taxonomy and nomenclature of the rattlesnakes.

Humans, Chimpanzees, Gorillas and Orang-utans have all been placed in separate genera (by most biologists for many years), namely *Homo*, *Pan*, *Gorilla* and *Pongo* and yet have had their divergence dates (from the human line) reliably plotted in the vicinities of 4, 8 and 12 million years, all being under the time frames postulated for the various rattlesnake groups within this paper. See for example, Hobolth, A., Christensen O. F., Mailund T, Schierup M. H. (2007), Stauffer et. al. (2001), Chen and Li (2001), Carroll (2003) and sources cited within these papers, the primary (2007) paper quoting a 4.1 million-year-old date for the Human/Chimp split.

For Gibbons, with a diversion from the human lineage plotted at between 18 and 12 Million years ago, biologists have gone so far as to place them in a separate family, *Hylobatidae*, which if cross applied consistently to the rattlesnakes would place some genera as defined here within the same realm.

Please note, I do not advocate such a split for these snakes (at family level).

However of note is that no species of *Homo* is known from more than three million years ago, with most authorities putting the furthest date at about two million years ago.

LIKELY REACTIONS TO THE NEW CLASSIFICATION OF RATTLESNAKES

Upon publication of this paper, I can safely anticipate the likely result in the herpetological community.

If consistency means that the four higher ape genera of *Homo*, *Pan*, *Gorilla* and *Pongo* remain separate, then surely the same must apply to the rattlesnakes described above.

Some will accept the classification within and use it forthwith

and others won't.

However by relying on published data, including the molecular and morphological and consistent criteria, two sets of arguments should be avoided.

One argument raised at times of reclassification, is to question the evidence. The papers of Murphy et. al. 2002 and data within, as well as other cited studies of the molecular biology of these snakes provides more than sufficient evidence of differentiation between named genus and subgenus groups.

As the differences between groups are not in dispute (except perhaps by so-called "flat earthers"), the only potential for argument is to where one draws the line in terms of defining "genus", or "subgenus".

Reference to recent reclassifications elsewhere involving reptiles also shows that it is consistent to apply the same reasoning to the rattlesnakes to derive the said genera, at the above identified points of division as a most conservative position.

On that basis, I see it as inevitable that the broad thrust of what is presented here, will be accepted in total by herpetologists within a generation (20 years).

In the short term there will be two main lines of resistance.

One will be from those opposed to any change and prefer to use nomenclature they know is wrong, but know (as in remember) nonetheless.

For some herpetologists, there is short-term argument this way.

However over time this will subside.

More insidious is the inevitable resistance from a small group of so-called herpetologists and others, who oppose anything I do. Known generally as the "truth haters", they include individuals by the names of Wulf Schleip, Wolfgang Wüster and David Williams, who between them have a consistent and long track record of form including repeated scientific frauds, plagiarisation, lies, misrepresentations, convictions for wildlife smuggling, animal cruelty, illegal rigging of online hotel competitions and more.

If their past (last 10 years) performance is anything to go by, you can expect them to threaten journal editors who dare to publish so-called "Hoser nomenclature", and to stalk and harass internet sites that use any "Hoser names".

For a better appraisal of the tactics of these men see Hoser (2009), or Hoser (2012).

The warnings against these people and their tactics apply here again.

While arguments with merit are always worthwhile, I'd have trouble recalling any from any of these people (or their aliases and assumed names they post under), at any stage in the last ten years in terms of claims against my papers and the like.

There is no doubt that this small group of "truth haters" will present the greatest resistance to the adoption of the taxonomy and nomenclature within this paper.

However I liken their expected resistance to that of a man trying to stop the tide from coming in.

Fortunately the ultimate test of science is the truth and not which group of individuals makes the most "noise".

RATTLESNAKE AND REPTILE CONSERVATION

While this paper isn't about this topic, it is clear that it is close to my heart as indicated by the names assigned to

some taxa and the histories of those persons so honoured.

It is a fact of life that people only desire to protect and study animals if they have access to them.

To that extent I have worked for this ideal in Australia, the USA and elsewhere for more than 30 years.

It is no co-incidence that my greatest adversaries are also included among the greatest threats to the conservation cause.

In Australia, the very group of people just named who have spent years doing little more than stalking the web and attacking my interests, have also been responsible for the recent attempts to remove the hard-won rights of private individuals to keep reptiles as pets in this jurisdiction.

They have also perpetuated the idea that is acceptable to inflict cruelty and death to snakes by mishandling with back-breaking tongs and other brutal methods, which when copies lead to increased deaths of reptiles and humans alike.

Convicted smuggler David John Williams (posting on the internet under countless pseudonyms, including "toxinologist"), for many years himself a private keeper of reptiles was one such person who's own interests could be conceivably impacted from any government ban in keeping reptiles.

His actions against private keepers have however been fuelled in part by his own recently found security in that he has associated himself with Melbourne University as a newly incarnated "academic" and can run around the countryside collecting and keeping reptiles under their government owned umbrella.

His close friend Wolfgang Wüster has been in a similar position in Wales (UK) and actively aided and abetted the removal of the rights of private keepers in his jurisdiction, happy in the knowledge that this helps remove his potential "competitors".

In the USA, where until recently individual freedoms were greatly cherished, the same threats to private ownership of reptiles has re-emerged with the recently enacted Giant Constrictors ban of 2012, the first in a long list of restrictions likely to be imposed.

The two above-named men have worked hard to white-ant resistance to these newly enacted and further proposed bans on keeping and studying reptiles.

This includes inflammatory posts on internet forums and elsewhere with a view to attacking and discrediting the main advocates in favour of retaining the rights of private individuals to have contact with wildlife (including all reptiles).

The attempts to ban ownership start on species perceived as "dangerous", like rattlesnakes and "killer pythons", as seen in proposals like that recently enacted on pythons by the US Federal government.

Once "law" the anti's use this success as encouragement to go further and to seek to ban other "pets", the endpoint being a total removal of public access to wildlife.

At that point a general desire to study and conserve these species is also removed.

The long term endpoint is a heightened risk of extinction for taxa for several reasons.

This includes the fact that there are few if any captive stocks to protect against any calamity that may exterminate wild stocks.

At the present time, few rattlesnakes are regarded as threatened, however as seen with the frogs declining through

Chytrid fungus (*Batrachochytrium dendrobatidis*) over the last three decades (Di Rosa, et. al. 2007, Stuart, et. al. 2004), it is entirely possible for common and "secure" species to become rare, endangered or even "extinct" within a few short years.

Noting that numerous pathogens have been spread worldwide, the details of which are generally little known, it'd be reckless to do anything that may reduce the chances of survival for any higher vertebrate taxa, including rattlesnakes, coral snakes and all other reptiles.

To that end, readers are asked to use common sense and support the right of all sections of the community to have (as a general right) legal and unfettered access to wildlife including rattlesnake species.

The claims of danger and the like in terms of the snakes do not carry weight either.

The number of people killed annually by these creatures is nothing compared to the millions who die from smoking, driving motor vehicles, skin cancer and diet/obesity related diseases, and yet there are no major pushes to ban people from smoking, sunbaking, driving motor vehicles or eating rubbish food.

Keeping younger (under 18 year-old) people away from so-called dangerous snakes like rattlesnakes does not do any benefit to the long-term safety of the majority.

With common sense, bites (of humans) are virtually unheard of and children discouraged from interacting with wildlife, including rattlesnakes are more likely to turn to harmful alternatives like drugs, violence and the like.

Many teenagers are mature and capable enough of interacting with venomous reptiles without undue risk of harm to either themselves or the snakes.

In other words it is in our own self-interest and that of our children to conserve wildlife including the rattlesnakes and to ensure that public have access to this wildlife.

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Most have been named previously either at the end of other papers or in the relevant sections of my nine books.

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SUMMARY OF KNOWN LIVING RATTLESNAKE (SPECIES) TAXA AND THEIR NEW GENERIC AND SUBGENERIC PLACEMENTS (HOSER 2012)

GENUS *SISTRURUS* GARMAN 1883

Type species: *Crotalinus catenatus* Rafinesque 1918.

S. miliarius (Linne 1766)

GENUS *PIERSONUS* GEN. NOV.

Type Species: *Crotalus ravus* Cope 1865

P. ravus (Cope 1865)

GENUS *CROTALUS* LINNE 1758

Type Species: *Crotalus horridus* Linne 1758

SUBGENUS *SAYERSUS* SUBGEN. NOV.

Type species: *Crotalinus viridis* Rafinesque 1818

C. scutulatus (Kennicott 1861)

C. oreganus Holbrook 1840

C. abyssus Klauber 1930

C. cerberus Klauber 1949

C. concolor Klauber 1936

C. helleri Meek 1905

C. lutosus Klauber 1930

GENUS *AECHMOPHRYS* COUES 1875

Type species: *Crotalus cerastes* Hallowell 1854

SUBGENUS *COTTONUS* SUBGEN. NOV.

Type species: *Crotalus intermedius* Troschel 1865

A. pricei (Van Denburgh 1895)

A. tancitarensis (Alvarado-Diaz and Campbell 2004)

A. transversus (Taylor 1940)

A. willardi (Meek 1905)

SUBGENUS *RATTLEWELLSUS* SUBGEN. NOV.

A. polystictus (Cope 1865)

GENUS *CAUDISONA* LAURENTI 1768

Type species: *Crotalus durissus* Linne 1758

C. culminatus (Klauber 1952)

C. simus (Latreille 1801)

C. tzabcan (Klauber 1952)

C. vegrandis (Klauber 1941)

C. unicolour (van Lidth de Jeude 1887)

SUBGENUS *PILLOTUS* SUBGEN. NOV.

Type species: *Caudisona enyo* Cope 1861

SUBGENUS *SMYTHUS* SUBGEN. NOV.

Type species: *Crotalus molossus* (Baird and Girard 1853)

C. basiliscus Cope 1864

C. estebanensis (Klauber 1949)

C. totonacus (Gloyd and Kauffeld 1940)

GENUS *UROPSOPHUS* WAGLER 1830

Type species: *Uropsophus triseriatus* Wagler 1830

U. aquilus (Klauber 1952)

U. lepidus (Kennicott 1861)

U. pusillus (Klauber 1908)

GENUS *CUMMINGEA* GEN. NOV.

Type species: *Crotalus stejnegeri* Dunn 1919

C. ericsmithi (Campbell and Flores-Villella 2008)

C. lannomi (Tanner 1966)

GENUS *HOSEREA* GEN. NOV.

Type species: *Crotalus atrox* Baird and Girard 1853

H. tortugensis (Van Denburgh and Slevin 1921)

SUBGENUS *EDWARDSUS* SUBGEN. NOV.

Type species: *Crotalus adamanteus* Beauvois 1799

SUBGENUS *MULLINSUS* SUBGEN. NOV.

Type species: *Crotalus ruber* Cope 1892

H. exsul (Garman 1883)

H. lorenzoensis (Radcliffe and Maslin 1975)

SUBGENUS *CRUTCHFIELDUS* SUBGEN. NOV.

Type species: *Crotalus catalinensis* Cliff 1954

MATTEOEA GEN. NOV.

Type species: *Caudisona mitchellii* Cope 1861

M. angelensis (Klauber 1963)

M. tigris (Kennicott 1859)

SUMMARY OF KNOWN LIVING NEW WORLD CORAL SNAKES (SPECIES) TAXA AND THEIR NEW GENERIC AND SUBGENERIC PLACEMENTS (HOSER 2012)

GENUS *HOSERELAPIDEA* GEN. NOV.

Type species: *Coluber fulvius* Linnaeus, 1766.

- H. albicinctus* (Amaral 1926)
H. alleni (Schmidt 1936)
H. annellatus (Peters 1871)
H. averyi (Schmidt 1939)
H. bernadi (Cope 1887)
H. bocourti (Jan 1872)
H. bogerti (Roze 1967)
H. browni (Schmidt and Smith 1943)
H. catamayensis (Roze 1989)
H. circinalis (Dumeril and Bibron 1854)
H. clarki (Schmidt 1936)
H. corallinus (Merrem 1820)
H. diastema (Dumeril, Bibron and Bibron 1854)
H. distans (Kennicott 1861)
H. dumerilii (Jan 1858)
H. ephippifer (Cope 1886)
H. hippocrepis (Peters 1862)
H. langsdorffi (Wagler 1824)
H. latifasciatus (Schmidt 1933)
H. limbatus (Fraser 1964)
H. margaritiferus (Roze 1967)
H. medemi (Roze 1967)
H. mertensi (Schmidt 1936)
H. nebularis (Rose 1989)
H. nigrocinctus (Girard 1855)
H. oligoanellatus (Ayerbe and Lopez 2002)
H. ornatissimus (Jan 1858)
H. pachecogili (Campbell 2000)
H. paraensis (Cunha and Nascimento 1973)
H. peruvianus (Schmidt 1936)
H. petersi (Roze 1967)
H. proximans (Smith and Chrapliwy 1958)
H. psyches (Daudin 1803)
H. putumayensis (Lancini 1962)
H. remotus (Roze 1987)
H. ruatanus (Gunther 1895)
H. sangilensis (Niceforo-Maria 1942)
H. steindachneri (Werner 1901)
H. stewarti (Barbour and Amaral 1928)

H. stuarti (Roze 1967)

H. tener (Baird and Girard 1853)

SUBGENUS *BINGHAMUS* SUBGEN. NOV.

Type species: *Elaps elegans* Jan 1858

H. laticollaris (Peters 1869)

TROIANOUS SUBGEN. NOV.

Type species: *Elaps mipartitus* Dumeril, Bibron and Dumeril 1854

H. multifasciatus (Jan 1858)

H. multiscutatus (Rendahl and Vestergren 1940)

H. spurelli (Boulenger 1914)

GENUS *LEPTOMICRURUS* SCHMIDT 1937

Type species: *Elaps collaris* Schlegel 1837

L. narducci (Jan 1863)

L. renjifo (Iamar 2003)

L. scutiventris (Cope 1870)

GENUS *MICRUROIDES* SCHMIDT 1928

Type species: *Elaps Euryxanthus* Kennicott 1861

GENUS *MICRURUS* WAGLER 1824

Type species: *Micrurus spixii* Wagler 1824

M. altirostris (Cope 1860)

M. ancoralis (Jan 1872)

M. baliocoryphus (Cope 1860)

M. brasiliensis (Roze 1967)

M. decoratus (Jan 1858)

M. diana (Roze 1983)

M. dissoleucus (Cope 1860)

M. filiformis (Gunther 1859)

M. frontalis (Dumeril, Bibron and Dumeril 1854)

M. hemprichii (Jan 1858)

M. ibiboboca (Merrem 1820)

M. isozonus (Cope 1860)

M. lemniscatus (Linnaeus 1758)

M. meridensis (Roze 1989)

M. pyrrhocryptus (Cope 1862)

M. serranus (Harvey, Aparicio-E and Gonzalez-A 2003)

M. surinamensis (Cuvier 1817)

M. tschudii (Jan 1858)



A NEW GENUS OF PITVIPER (SERPENTES: VIPERIDAE) FROM SOUTH AMERICA.

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ABSTRACT

The Pitvipers of Central and South America have been the subject of intense scrutiny by taxonomists in recent years.

The so-called *Bothrops* group (*sensu lato*) in particular has been subject of intense study and debate (see Fenwick, et. al. 2009) and sources cited therein.

As a result, what was formerly regarded by many as a single highly speciose genus has been subdivided into several genera, namely, *Bothriopsis* Peters 1861, *Bothrocophias* Cutberlet and Cambell 2001, *Bothropoides* Fenwick, et. al. 2009, *Bothrops* Wagler 1824 and *Rhinocerophis* Garman 1881.

There remain obviously ungrouped species that clearly do not fit into any of these genera in terms of a consistent level of definition of the genera and based on results of several studies published by various authors.

To rectify this situation a new genus *Jackyhoserea* gen. nov. has been created to accommodate these species, namely the species formerly identified as *Bothrops andianus*, *B. pictus*, *B. lojanus*, *B. roedingeri* and *B. barnetti*, with *B. pictus* nominated as the type species.

Due to obvious differences in both morphology and habits, *B. andianus* is further placed in a new subgenus *Daraninus* subgen. nov..

Keywords: Taxonomic revision; new genus; new subgenus; Viperidae; Crotalinae, *Jackyhoserea*; *Daraninus*; *Bothrops*; *pictus*; *andianus*; *barnetti*; *lojanus*; *roedingeri*; Hoser; snake; subgenus; genus.

INTRODUCTION

Pitvipers within the genus group *Bothrops sensu lato* have been widely studied, with results published by Carrasco et. al. (2010), Jansen (2008) and others.

Papers by Fenwick, et. al. (2009), Pyron et. al. (2012) and others have greatly clarified the phylogenetic positions of the various species level taxa within this and other Colubroidea.

The excellent monograph by Campbell and Lamar (2004) (volume one) meticulously distills and details a summary of the available information about the relevant taxa in detail.

This paper does not seek to rehash this information, but instead seeks to draw attention to the fact that within the *Bothrops sensu lato* group, the component species have to the present date been placed within various genera, currently recognised as including the following:

Genus: *Bothriopsis* Peters, 1861 (Forest Vipers)

Genus: *Bothrocophias* Campbell and Gutberlet 2001 (Toad-headed Pitvipers)

Genus: *Bothrops* Wagler, 1824 (Lanceheads)

The component species within each group are listed in Campbell and Lamar (2004). A more recent view of the exact composition of the three relevant genera including recently described taxa such as *Bothrops marmoratus* Da Silva and Rodrigues (2008) or *Bothrops ayerbeii* Folleco and Javier (2010) can be found online on the "reptile database" controlled by Peter Uetz at:

<http://reptile-database.org/>

although it should be noted that the content and points of view expressed on this site are somewhat subjective and change regularly.

While snakes within the now reduced genus *Bothrops* tend to be similar in form and habit, five species stand out as exceptional and different.

These species recognised as of early 2012 are: *Bothrops andianus*, *B. barnetti*, *B. lojanus*, *B. pictus*, *B. roedingeri*.

While there had been reluctance by previous herpetologists to recognise these differences taxonomically, a number of recent molecular studies including those by Fenwick, et. al. (2009) (see fig 1. p. 623) and Pyron et. al. (2012) (see Fig 2A p. 334), both with reference to the species taxon, *pictus*, have conclusively shown that continued inclusion of these snakes within the genus *Bothrops* as currently understood is not appropriate.

The molecular results also concur with the quite different habits and ecology of the five taxa subject of this paper, namely *B. andianus*, *B. pictus*, *B. lojanus*, *B. roedingeri* and *B. barnetti*, in that all are distinctive in their preference for high altitude dry habitats (sometimes termed the "arid temperate zone"), strongly terrestrial habits, restricted distributions and local abundance in given locations.

As there is not an available genus name for these snakes, a new genus is created herein and diagnosed according to the ICZN code (Ride et. al. 1999) to accommodate these snakes.

Recognising further obvious differences between the said snakes, a subgenus is also created to split the group further.

BOTHROPS SENSU LATO.

While it is not necessary to rehash the finer detail of these well-known and recognised snakes for the purposes of this paper, it is worth noting that these pitvipers have their centre of distribution in South America.

Pitvipers are defined by the large distinct heat-sensitive loreal pits on the face between the nostril and the eye.

Being venomous snakes, they possess large retractable fangs at the front of their mouth, that becomes erect as the mouth opens. These traits alone separate the pitvipers from all other snakes in the region.

Between the three genera *Bothrops*, *Bothriopsis* and *Bothrocophias* there are in excess of 40 recognised species taxa. Using the definitions of each genus as given in Campbell and Lamar (2004) relied upon herein as well for the purposes of the formal descriptions below (if needed and if as required), it's worth noting that *Bothrops* contains over 30 described species, while each of the other genera has less than ten.

In common, the snakes of these genera range in build from slender to moderately stout and have a relatively long tail spine. None have a supraocular spine or horn, which separates these snakes from sometimes superficially similar species in other genera.

Bothriopsis is separated from the other two genera by the presence of a strongly prehensile tail, with the distal portion curving strongly downward both in life or in preservative.

In turn *Bothriopsis* is separated from the superficially similar pitviper genus *Bothriechis* by having a relatively long tail spine (as opposed to short and blunt) and usually divided subcaudals, (as opposed to undivided in *Bothriechis*).

Bothrops is separated from *Bothrocophias* by lacking a distinct series of pale spots or bars on the infralabials; dorsals often strongly keeled, but not tubercular; intersupraoculars usually keeled; a narrow skull, the distance across the frontal bones is less than the width of the skull at the anterior end of the supratemporals.

By contrast *Bothrocophias* has a series of pale spots or bars

on the infralabials; dorsal keels are tubercular; intersupraoculars are smooth or keeled; the skull is broad and the distance across the frontal bones is equal to the width of the skull at the anterior end of the supratemporals.

GENUS BOTHROPS WAGLER, 1824

The etymology for the genus name is derived from the Greek bothros, meaning "pit" and ops, meaning either "eye" or "face" with reference to the distinct heat-sensitive loreal pits on the face between the nostril and the eye.

They have the common name "Lancehead" in reference to the distinctive shape of their head.

Snakes within this genus range in adult size from about 50 cm to in excess of 2 metres for largest specimens of a few species.

They are distributed mainly in South America, although two species reach Middle America, one *B. asper*, ranging as far north as northern Mexico.

Most are terrestrial, although all can climb, with one species, *B. insularis* commonly found in trees.

Most species in the genus as currently recognised have a sharply defined canthus rostralis and an unelevated snout, the exceptions being the species *lojanus* and *barnetti*, both of which have a slightly upturned snout (see below) and *ammodytoides* which has a nasal appendage.

The scales on the crown of the head are highly variable and not of taxonomic significance. although the intersupraoculars number from 3 to 14. There are generally 7-9 supralabials, (*cotiara*, *pictus* and *roedingeri* have 11 or more), 9-11 infralabials, 21-29 dorsal mid body rows, 139-240 ventrals and 30-86 usually divided subcaudals.

The everted hemipenes are 8-11 subcaudals long and deeply divided.

GENUS JACKYHOSEREA GEN. NOV.

Type species: *Lachesis picta* Tschudi 1845

(Identified most recently as *Bothrops pictus* (Tschudi 1845)

Diagnosis: All are moderately stocky terrestrial lanceheads averaging 40-140 cm in total length and are found in a variety of situations, but most commonly in high altitude areas of somewhat drier habitats, sometimes best described as the "arid temperate zone" although in driest situations they are usually found in or near the riparian zone.

The dorsum of the body is usually a pale grey tan or reddish brown background colour; that is with a pattern running down the back (occasionally indistinct in old and pre-slough animals), sometimes in a highly broken pattern of blotches, triangles or similar interspersed with lighter pigment; invariably there is a thick dark postorbital line running from the eye to the rear of the head crossing three to four pairs of supralabials and continuing to the rear of the head, sometimes angled slightly downward to the end of the jaw or just past it, below which are whitish supralabials, this colour being maintained to the snout, although the head in front of the eye lacks the dark postorbital stripe; the snout may be slightly elevated or flat.

Jackyhoserea gen. nov. are separated from all species within the genus *Bothrops* (defined above and forming a part of this description), by the following suite of characters: The canthus does not curve upwards, there is a dorsal pattern of small blotches, many of which are located mid-dorsally or fused to form a zig-zag stripe, occasionally trapezoidal or triangular that alternate or meet mid-dorsally; 3-10 intersupraoculars; 8-11 supralabials with the second, third or none fused with the prelacanal; 10-12 infralabials; 21-25 (usually 23) dorsal

mid body rows, 157-186 ventrals in males, 165-186 ventrals in females, 37-63 all divided subcaudals in males and 33-58 all or mostly divided subcaudals in females.

Restricted to South America.

Etymology: Named in honour of my daughter Jacky Hoser. She spent much of the first 10 years of her life educating fellow children about reptiles and by free-handling the world's deadliest snakes on a daily basis, was able to de-demonise these magnificent reptiles.

She was able to handle these snakes in total safety, because they had been made venomoid, as in permanently devenomized (see Hoser 2004). More significantly however, is that after many years of free handling taxa such as Taipans (*Oxyuranus* and *Parademansia*), Tiger Snakes (*Notechis*), Death Adders (*Acanthophis*), Brown Snakes (*Pseudonaja*) and Black Snakes (*Pseudechis*), she had never been bitten once.

By contrast, many so-called snake handlers in Melbourne attacking their pet elapid snakes with devices like metal tongs had made many trips to the emergency wards of hospitals over the same time period (2002-2012) after their snakes had not surprisingly bitten them as a result of the pain inflicted on them.

Species in genus *Jackyhoserea* gen. nov.

Jackyhoserea pictus

Jackyhoserea andianus

Jackyhoserea barnetti

Jackyhoserea lojanus

Jackyhoserea roedingeri

SUBGENUS *DARANINUS* SUBGEN. NOV.

Type species: *Bothrops andianus* Amaral 1923

Diagnosis: Currently a monotypic subgenus, including only the type species.

Daraninus gen. nov. is separated from all other members of the genus *Jackyhoserea* gen. nov. by the following suite of characters: 7 supralabials, the second usually fused with the prelacunal to form a lacunolabial), versus 9-10 supralabials in all other *Jackyhoserea* gen. nov.; 8-11 infralabials, versus 10-12 infralabials in all other *Jackyhoserea* gen. nov.; unlike other *Jackyhoserea* gen. nov. in this taxon (*Daraninus* gen. nov.) the area occupied by interspaces (of the dorsal or dorsolateral blotches) is considerably and conspicuously less than that occupied by the dorsal or dorsolateral blotches.

This is a relatively large species, recorded as exceeding 1.25 metres in total length (Campbell and Lamar (2004).

The taxon is restricted to the central Andes in Western South America; known from the departments of Cuzco and Puno in southern Peru and the departments of La Paz, Cochamba and Santa Cruz in Bolivia. Most specimens seem to be found at the type locality, Machu Picchu (eastern Andes-Rio Urabamba) and along the Rio Cosireni. The known vertical distribution of this taxon is 1,800 to 3,300 metres. The higher altitude limit for this taxon exceeds all other records for the genera *Jackyhoserea* gen. nov. and *Bothrops*.

Common name: Andean Lancehead.

Species in subgenus *Daraninus* gen. nov.

Jackyhoserea andianus Amaral 1923

Etymology: Named in honour of Dara Nin, of Ringwood, Australia. For some years now, he's had to put up with my terrible jokes as we have travelled Australia educating people about reptiles, under the banner of "Snakebusters, Australia's best reptiles".

Magnificently loyal and impeccably reliable, he's educated countless people about reptiles, shattered countless lies and myths peddled by inexperienced business competitors and their close mates in government and no doubt saved the lives of many reptiles through his excellent work.

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Two new genera of Water Snake from North America. The subdivision of the genera *Regina* Baird and Girard, 1853 and *Nerodia* Baird and Girard, 1853 (Serpentes: Colubridae: Natricinae).

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ABSTRACT

The colubrids of North America have been the subject of taxonomic attention for decades, with numerous genera being erected for morphologically and ecologically distinct snakes. The North American Water Snakes, once all placed in a single genus *Natrix* (e.g. Conant 1975) have since been a part of a wider break-up of that genus and been placed in several well-defined genera.

The genus *Nerodia* is clearly a paraphyletic group as confirmed by numerous studies.

The Green Water Snake currently known to most herpetologists as *Nerodia cyclopian* and the morphologically similar *N. floridana* are substantially different to all others in the established genus *Nerodia* Baird and Girard, 1853 (*sensu lato*) and have been recognised as highly distinct from the other water snakes since at least 1938 (Clay 1938).

It's been recognised for a long time that they should be placed in a separate genus.

This paper formalises that position by erecting and defining a new genus, namely *Funkus* gen. nov. to accommodate the two species.

The genus *Regina* Baird and Girard, 1853 as currently understood at start 2012 is also ambiguous, with the four known-species currently placed within the paraphyletic genus being sufficiently diverse to warrant being divided (Alfaro and Arnold, 2001).

As a result, it is herein subdivided three ways with the resurrection of *Liodytes* Cope, 1892 for the species *alleni* and *rigida*, retention of *grahamii* in *Regina* (now monotypic) and the creation of a new monotypic genus *Mariolus* gen. nov. for the species *septemvitta*.

Keywords: Taxonomic revision; new genus; *Funkus*; *Nerodia*; *cyclopian*; *floridana*; *Regina*; *alleni*; *rigida*; *grahamii*; *septemvitta*; *Liodytes*; *Mariolus*; Hoser; water snake; snake; genus.

INTRODUCTION

Water snakes, currently placed in the genus *Nerodia* are familiar to most herpetologists in the United States. They are defined as a group in Conant (1975) under the genus name *Natrix* and similarly defined in more recent texts and these adequately define the group for the purposes of those not familiar with these snakes.

While Water Snakes do well in captivity, they are not popular or commonly kept due to a general preference for more readily available (in the pet trade) docile species such as Corn Snakes (*Pantherophis guttatus*) and the many pythons and boas available.

While effectively harmless, many Water Snakes won't hesitate to bite when confronted by people, leading to a general reluctance for people to keep them as pets or worse still, to try to kill them when seen in the wild.

These harmless snakes live in proximity to water into which they enter when they feel threatened.

With a body that is moderate to heavy in build, they range in colour through dark green, olive, or brown dorsally and may be confused by lay people with the venomous Cottonmouth (Genus *Agkistrodon*) another native species of where they occur.

The latter, being Pitvipers have large fangs and single subcaudals, versus no fangs and all divided subcaudals in all the water snakes. Cottonmouths, being Pitvipers have the characteristic deep pit between the eye and the nostril, absent in Water Snakes.

Female water snakes usually grow larger than the males. Published studies relating to the genus *Nerodia* as widely recognised, include Lawson (1987) and others.

Numerous specific species-related studies have been conducted for most within the genus *Nerodia* as recognised to date.

Publications relevant to the Green Water Snake and Florida Green Water Snake (species *cyclopian* and the morphologically similar *floridana*) include Allen (1932), Burt (1935), Clay (1938), Dundee and Rossman (1989), Enge (2009), Goff (1936), Lawson (1987), Neill and Rose (1953), Pyron et. al. (2010), Pearson (1966), Sanderson (1993) and Thompson and Crother (1998).

Between them, their evidence provides a compelling argument to remove the taxa *cyclopian* and *floridana* from genus *Nerodia* and this is now done herein by the formal erection and diagnosis of a new genus in accordance with the Zoological Code (Ride, et. al. 1999).

GENUS *FUNKUS* GEN. NOV.

Type species: *Tropidonotus cyclopian* Duméril and Bibron, 1854

(Identified most recently as *Nerodia cyclopian* (Duméril and Bibron, 1854)).

Diagnosis: North American Water Snakes are separated from all similar snakes in the region by their keeled scales and divided anal plate.

Genus *Funkus* gen. nov. are separated from all other North American water snakes (currently placed in the genus *Nerodia*), as well as snakes in the allied genus *Regina sensu lato* and (all other snakes previously placed in the expanded genus *Natrix* as formerly recognised for North American snakes (see Conant (1975) for a definition of genus *Natrix sensu lato*)), by having one or more small scales under the eye (suboculars), giving the appearance of a ring of small plates around the eye; ventrally *Funkus* gen. nov. are

brownish, yellowish or white on the anterior third, and on the remainder they are brownish, yellowish or white with yellow or white semicircles.

Ventral scale colouration varies within the genus and can be used to separate the two known species.

Adults average 76-140 cm (30-55 inches) long; there is a listed record of 188 cm (74 in.) for a specimen of the species taxon *floridana* (Conant 1975).

This genus is endemic to the south and south-eastern United States.

Clay (1938), page 177 also provided a diagnosis for the species taxon *cyclopian* which also, as slightly modified herein, diagnoses the new genus *Funkus* gen. nov.

He wrote that these snakes may be separated other North American species of water snakes by the presence of one or more subocular plates and an ill-defined dorsal color pattern of about 50 mid-dorsal bars alternating with a lateral series, which in turn is more or less in alternation with a second and lower lateral series.

The typical species (defined herein as the species *cyclopian*) is distinguished from *floridana* by having the belly brown, scale rows 27 in males and 29 in females, and subcaudals averaging 73 in males and 64 in females.

F. floridana is distinguished from *F. cyclopian* by having the belly predominantly yellow or white, scale rows 29 in males and 31 in females, and subcaudals averaging 82 in males and 73 in females.

Common names: *Funkus cyclopian* is known as the Green Water Snake.

Funkus floridana is known as the Florida Green Water Snake.

Etymology: Named in honour of Dr. Richard Funk for his many contributions to herpetology and in his role as a veterinary surgeon specializing in reptiles, for improving the health and welfare of countless captive reptiles.

It's significant that a genus of snakes is named after Dr. Funk in that I first met him at Wayne Hill's, National Reptile Breeder's Reptile expo in Orlando, Florida in August 1993, at which time I also saw my first *Funkus*.

Not only that, but Dr. Funk himself lived in Florida for many years before more recently moving to Mesa Arizona.

As I write this paper in 2012, the long-cherished legal right of people to be able to go to such events to acquire captive reptiles for pets or study is under threat and will be lost forever unless people are vigilant in protecting these rights.

It should be noted that the enemies of herpetology and the associated discipline of herpetoculture, (that is the keeping of reptiles) are often within the keeping fraternity and will for their own selfish commercial motives put the rights of other reptile keepers under threat and try to criminalize those whom they view as potential competitors.

Species in genus *Funkus* gen. nov.

Funkus cyclopian Duméril and Bibron, 1854

Funkus floridana (Goff 1936)

Separation of the species level taxa within *Funkus* gen. nov.

F. floridana is distinguished from *F. cyclopian* by having the belly predominantly yellow or white, scale rows 29 in males and 31 in females, and subcaudals averaging 82 in males and 73 in females (Clay 1938:p. 177).

F. cyclopian is distinguished from *F. floridana* by having the

belly brown, scale rows 27 in males and 29 in females and subcaudals averaging 73 in males and 64 in females.

The two species are also separated by known distribution.

F. cyclopius is found in the Mississippi Valley from far south Illinois to the Gulf of Mexico, from the extreme south-west Alabama to south-east Texas.

F. floridana is found in the south of South Carolina to the tip of Florida, west through the Florida panhandle to Mobile Bay, Alabama.

SPECIES REMAINING IN THE GENUS *NERODIA* BAIRD AND GIRARD, 1853

Nerodia clarkii (Baird and Girard, 1853)

Nerodia erythrogaster (Forster, 1771)

Nerodia fasciata (Linnaeus, 1766)

Nerodia harteri (Trapido, 1941)

Nerodia paucimaculata (Tinkle and Conant, 1961)

Nerodia rhombifer (Hallowell, 1852)

Nerodia sipedon (Linnaeus, 1758)

Nerodia taxispilota (Holbrook, 1838)

GENUS *REGINA* BAIRD AND GIRARD 1853

The water snakes placed within this genus are quite diverse in form and habit.

Cope 1892 erected a genus *Liodytes* for the species taxon *alleni*.

Most authors since then have subsumed this genus into one or more others, most recently being the genus *Regina*, for which the significantly different type species is *R. grahamii*.

A similar situation to that just described for the genus *Nerodia* applies for the genus *Regina* Baird and Girard 1853 as currently understood at start 2012.

While the component species are obviously similar and related, they are sufficiently distant and differentiated to be placed in separate genera.

Differences between the four species are well-known and detailed by Alfaro and Arnold (2001), Conant (1975), Ernst, Gibbons and Dorcas (2002) and others.

While the use of more than one genus for the four species presently within *Regina* has been the preferred position of a number of recent authors, including for example Price (1983), the split has only been two-way for the four relevant species. This has been the placement of *alleni* and *rigida* within *Liodytes* on the basis of dorsal microdermatoglyphics, while retaining the other two species *grahamii* and *septemvittata* within *Regina*.

However this ignores the significant differences between the two species left within *Regina*.

Alfaro and Arnold (2001) found the genus *Regina* as defined to be paraphyletic and effectively split three ways based on their examination of mitochondrial DNA. They suggested a re-evaluation of the taxonomic status of the genus.

Pyron et. al. (2010) produced almost identical results in terms of the four species of *Regina* in their massive global assessment of snakes, but they were more preoccupied with higher level taxonomy of all snakes.

Relying on these two sets of results and the work of earlier authors, the genus *Regina*, is herein effectively split three ways as indicated in the abstract within this paper by the creation of one new genus, namely *Mariolisus* gen. nov. in accordance with the Zoological Code (Ride, et. al. 1999), and the previously mentioned resurrection of *Liodytes*.

GENUS *MARIOLISUS* GEN. NOV.

Type species: *Coluber septemvittatus* Say 1825

(Identified most recently as *Regina septemvittatus* (Say 1825)).

Diagnosis: The snakes of the genus *Mariolisus* gen. nov. are separated from others in the genus *Regina* sensu lato (including *Regina* and *Liodytes* as defined herein) by the following suite of characters; the presence of keeled, pitless mid dorsal body scales, two internasal scales, venter has two longitudinal stripes, not divided into half-moons and the lower dorsal scales are keeled (species taxon *septemvittata*). By process of elimination, snakes of the genera *Regina* and *Liodytes* are separated from *Mariolisus* gen. nov. by the following: *Regina* have the following: Dorsal body scales keeled, two internasals, a single dark median stripe on the venter or no dark pigment present (species taxon *grahamii*): *Liodytes* are separated by one of the following, either 1/ smooth dorsal scales (with the possible exception of the rear of the body), one internasal and no dark pigment on the tail (species taxon *alleni*), or 2/ keeled dorsal scales, two internasals and the venter consists of two dark longitudinal stripes or rows of half moons and lower dorsal scales smooth (species taxon *rigida*)

This is a monotypic genus, the only species taxon being *M. septemvittata*.

More generally snakes of the three genera, *Mariolisus* gen. nov., *Liodytes* and *Regina* are best described as follows: Relatively short, semiaquatic somewhat fossorial crayfish predators. Adult females are usually larger and more heavily built than males. Adult females have 118-178 ventrals, 47-87 subcaudals and shorter tails that comprise 16-30 percent of the body length. The smaller, usually thinner males have 110-175 ventrals, 55-89 subcaudals and longer tails that comprise 17.5-34 percent of the body length. In these snakes the short head is only slightly distinct from the neck and comprises only 3.8-5.6 percent of the body length. The nares are small and dorso-lateral. Eye diameter is 14-17 percent of the head length; the pupil is usually small and generally makes up about 24-50 percent of the eye diameter in adults as measured by Rossman (1963) (also reported by Ernst, Gibbons and Girard 2002). The nasal scale is partially divided by the nares and the internasal scales are narrowed anteriorly (*Liodytes alleni* has only one internasal scale). Present are a single loreal scale, 1-3 preoculars, 2-4 postoculars, 1+2(1-3) temporals, 6-9 supralabials, and 8-11 infralabials. The parietal scales may extend ventrolaterally between the postoculars and anterior temporal to narrowly touch the supralabials in some *Liodytes alleni*. All except *L. alleni* have keeled, pitless dorsal body scales; those above the anal vent and on the tail of *L. alleni* may be slightly keeled (more prominent in males) with shallow pits. These snakes usually have 19 (18-21) anterior body rows, 19 (18-21) mid body rows and 17 (15-19) preanal rows. Anal plate and subcaudals are divided. The slightly bilobed hemipenis extends 7-9 subcaudals and bears 1-2 large basal hooks and a single sulcus spermaticus.

The dorsal body pattern usually consists of stripes of three colours (dark brown, black or cream) with the paler lateral stripes located on the first and higher dorsal scale rows.

The colour of the venter for each species taxon is described above, but in terms of the group of snakes is either unmarked or has dark stripes, spots or half-moon shaped marks. The head is unpatterned, the smallish labials lack dark bars and there are no parietal spots.

The skull is moderately well-developed with the interorbital foramen situated below the frontals but above the parasphenoid. The parasphenoid lacks a ventral keel and the parietal bone lacks a posterior-medial ridge. The supratemporal is not reduced. The broad, flattened quadrate is little expanded dorsally. The basioccipital has no ventral process. Maxillary teeth are short, pointed to chisel-like and may be gradually enlarged toward the rear of the series. No diastema is present. Tooth counts are: maxilla 20-29, dentary 24-35, palatine 11-18 and pterygoid 16-24. The vertebrae have well developed hypapophyses and relatively narrow transverse processes which are anteroventral and rounded distally.

Common name: *Mariolisus septemvitta* is known as the Queen Snake.

Etymology: Named after George Mariolis, best known for winning or placing in various body-building competitions in his 20's and now in his 50's having spent 3 decades training champions in contests such as Joe Weider's Olympia (including the likes of Janet Kane (with Mark Ottobre) and Marie Saviane a three time winner), George Longinidis (World Champion Kick Boxer) and many others, his talent goes beyond physical training to the mental as well. As a result he's improved the lives of countless students and virtually everyone else who has had the pleasure of meeting him.

REGINA BAIRD AND GIRARD 1853

Type species: *Regina grahamii* Baird and Girard 1853

This genus is now monotypic.

Common name: *Regina grahamii* is known as the Graham's Crayfish Snake.

LIODYTES COPE 1892

Type species: *Regina alleni* (Garman 1874)

Species in genus Liodytes

Liodytes alleni

Liodytes rigida

Common names: *Liodytes alleni* is known as the Striped Crayfish Snake.

Liodytes rigida is called the Glossy Crayfish Snake.

KEY TO THE FOUR SPECIES WITHIN GENERA REGINA, LIODYTES AND MARIOLISUS GEN NOV.

(Adapted from Ernst, Gibbons and Dorcas (2002).

1. a. Dorsal body scales smooth, one internasal, no dark pigment on venter *L. alleni*
 - b. Dorsal body scales keeled, two internasals, venter with dark stripes or no dark pigment 2
- 2 a. A single dark median stripe on venter or no dark pigment present *R. grahamii*
 - b. Two dark longitudinal stripes or rows of half moons on the venter 3
- 3 a. Venter with two longitudinal rows of half moons, lower dorsal scale rows smooth *L. rigida*
 - b. Venter with two longitudinal stripes not divided into half moons, lower dorsal scales keeled *M. septemvitta*

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**THE DESCRIPTION OF A NEW GENUS OF WEST AUSTRALIAN
SNAKE AND EIGHT NEW TAXA IN THE GENERA *PSEUDONAJA*
GUNTHER, 1858, *OXYURANUS* KINGHORN, 1923 AND
PANACEDECHIS WELLS AND WELLINGTON, 1985
(SERPENTES: ELAPIDAE)**

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ABSTRACT

This paper defines and names new taxa from Australasia.

The taxon *Denisonia fasciata* Rosen 1905, placed most recently by most authors in the genus *Suta*, is formally removed from that genus and placed in a monotypic genus formally named and described herein.

Other taxa formally named and described for the first time include subspecies of the following; the broadly recognized species *Pseudonaja textilis* (known as the Eastern Brown Snake), *P. guttata* (Speckled Brown Snake) and *P. affinis* (Dugite), *Oxyuranus scutellatus* (Taipan) from Irian Jaya and western Papua as well as a second subspecies from north-west Australia and a hitherto unnamed subspecies of *Panacedechis papuanus* (Papuan Blacksnake) from the same general region.

The newly named taxa are: *Hulimkai* gen. nov., *Pseudonaja textilis cliveevatti* subsp. nov., *Pseudonaja textilis leswilliamsi* subsp. nov., *Pseudonaja textilis rollinsoni* subsp. nov., *Pseudonaja textilis jackyhoserae* subsp. nov., *Pseudonaja guttata whybrowi* subsp. nov., *Pseudonaja affinis charlespiersoni* subsp. nov., *Oxyuranus scutellatus adelynhoserae* subsp. nov., *Oxyuranus scutellatus andrewwilsoni* subsp. nov., and *Panacedechis papuanus trevorhawkeswoodi* subsp. nov..

Keywords: Taxonomy; snake; elapid; Taipan; Brown snake; new subspecies; new genus; *Panacedechis*; *Pseudonaja*; *textilis*; *cliveevatti*; *Leswilliamsi*; *rollinsoni*; *jackyhoserae*; *guttata*; *whybrowi*; *affinis*; *charlespiersoni*; *Oxyuranus*; *scutellatus*; *adelynhoserae*; *andrewwilsoni*; *papuanus*; *trevorhawkeswoodi*; *Hulimkai*; *Denisonia*; *fasciata*; *Suta*.

INTRODUCTION: DENISONIA FASCIATA ROSEN, 1905

The species first named by Rosen in 1905, remained in the genus *Denisonia* until relatively recently (e.g. Shine 1985), when along with congener, "*Denisonia punctata*" it was more recently moved to the genus *Suta* Worrell, 1961 (e.g. Cogger 2000).

Unlike all other snakes in the *Suta* genus as defined in texts like Cogger (2000), and the morphologically similar genus *Rhinoplocephalus* Muller, 1885 as defined in texts like Cogger (2000), the species *Denisonia fasciata* Rosen, 1905 is alone in having a well-defined dorsal pattern.

It further differs from all other relevant taxa in both habit and general body structure, being more elongate, having a significantly larger eye and having quite different behaviour to all others in those two genera, to which this taxon has most recently been associated with.

It is more a foraging predator rather than relying more ambush as the others tend to do, which in part explains the more elongate body.

The two species remaining in the genus *Denisonia*, including the type species *Denisonia maculata* (Steindachner, 1867) and *D. devisi* Waite and Longman, 1920 are quite different animals to *fasciata*, being considerably more stocky in build and of vastly different habits, so it is not tenable to place *fasciata* in that genus either.

The results of Pyron et. al. (2010) also confirm this view.

As a result a new monotypic genus is herein created and defined according to the ICZN rules, for the taxon originally described as *Denisonia fasciata* Rosen, 1905.

I should note however that the status of the taxon *Denisonia punctata* Boulenger 1896, currently placed within *Suta* (e.g. Cogger 2000) as well is also questionable. It clearly has similarities and affinities with *fasciata*, and alone among all others in the genus *Suta* as recognised by most others (e.g. Cogger 2000), is a species that often in part has the beginnings of a dorsal pattern on the flanks.

Ultimately this taxon may also have to be transferred to the genus *Hulimkai* Gen. Nov. as diagnosed below.

HULIMKAI GEN. NOV.**Type species: *Denisonia fasciata* Rosen, 1905**

Diagnosis: Separated from all other Australasian and Melanesian land dwelling (non-sea snake) elapids by the following suite of characters: No suboculars or curved tail spine at the end of the tail; the scalation is smooth and shiny with 17 (rarely 19) mid body rows; 140-185 ventrals that are not in any way keeled or notched; no suboculars; frontal longer than broad and more than one and half times as broad as the supraocular; no barring of the labials; internasals present; 20-40 all single subcaudals, single anal; 3-7 small solid maxillary teeth follow the fang; eye is of a medium size, the latter trait separating this snake from all other species of the genera (*Cryptophis* Worrell 1961, *Parasuta* Worrell 1961, *Rhinoplocephalus* Müller 1885, *Suta* Worrell 1961, *Unechis* Worrell 1961); further separated from those genera of snakes by the fact that the sole species within this genus taxon consistently has a well-defined dorsal pattern consisting of dark (near black) and lighter (usually brown) blotches on the dorsal surface forming a general patterned appearance not seen in any other relevant (similar) species, all of which are essentially one colour dorsally.

A western Australian endemic, it is further separated from all similar species of snakes by it's proportionately longer body in reflection of it's foraging feeding habits.

Etymology: Named in honour of Mr. Roman Hulimka, aged 89 years old as of the beginning of 2012 and still living life to the fullest. His achievements are many, although not necessarily in terms of his work with reptiles, however he has

played a pivotal role in our work with reptile education at Snakebusters for the best part of a decade and done countless favours for all who work with the company. Of note and relevance is that he will die of old age before any Snakebusters venomoid snakes regenerate venom and yes, he's handled them many times (legally) over the past decade.

BROWN SNAKES (GENUS PSEUDONAJA ET. AL.)

The genus *Pseudonaja* Gunther, 1858 has been the subject of taxonomic debate and relative uncertainty for many years, with one species, "*modesta*" recently removed and placed in another genus by Wells in 2002 under the name "*Notopseudonaja*", a move that has gained fairly wide support from herpetologists based on work and papers published in the 1980's.

Also and almost without exception, it is accepted by most authors that the species *Pseudonaja textilis* as recognized in most herpetological texts comprises at least number of distinct regional subspecies and perhaps even more than one species (Gillam 1979).

Wells (2002) placed the "*textilis*" group outside the traditional genus *Pseudonaja* and instead placed it in the (resurrected by them) genus *Euprepiosoma* Fitzinger 1860. At the same time, he subdivided the genus "*Pseudonaja*" into groups broadly consistent with each of the well-known species taxa, effectively creating a series of monotypic or near monotypic genera as alluded to above. For these, Wells erected a number of new names, including "*Placidaserpens*" for *guttatus* and "*Dugitophis*" for *affinis*.

Depending on where the line is drawn for assigning different species to a genus, the Wells (2002) position may be sensible, even if a radical departure from the conservative position taken by other publishing herpetologists in Australia and their past texts including Cogger (2000), Cogger, Cameron and Cogger (1983), Ehmann (1992), Gow (1989), Hoser (1989), Wallach (1985) and Wilson and Knowles (1988).

However I accept that the proposition to "kill" the name "*Pseudonaja*" for the "Eastern Brown Snakes" will be difficult for many to accept, bearing in mind many herpetologists have lived with the name "*Pseudonaja textilis*" for most of their lives, hence in this paper the genus name "*Pseudonaja*" is retained for these snakes, noting that for *textilis* and related taxa, they may ultimately be assigned to a different genus, the only available name to date being that resurrected by Wells and Wellington. A similar view is held for other taxa within the broadly recognized genus "*Pseudonaja*" as recognized in the general texts of Cogger (2000), Hoser (1989) and others.

The ICZN code (or "Rules") as known, dated 1 January 2000, seeks stability of names when possible (Ride et. al. 2000) and to that extent, the use of the name "*Pseudonaja*" as broadly recognized is retained here.

In recent years, several variants of "*Pseudonaja textilis*" as broadly recognised have been formally named or resurrected from the synonymy of *textilis* in at least the subspecies category.

These are as follows:

- *Pseudonaja textilis textilis* (Dumeril, Bibron and Dumeril, 1858) the type (sub) species from Eastern NSW and nearby areas.
- *Pseudonaja textilis bicucullata* (McCoy, 1879) from Victoria and nearby parts of inland New South Wales, including Albury, Wagga Wagga and much

of west and North-west NSW - a slightly smaller variant than the nominate subspecies. Its ventral patterning is usually not as distinct as seen in *P. textilis textilis*. It is also slightly less aggressive (on average) than the nominate form. Single subcaudals at the anterior end (usually a small number) are common in this taxa and the ones that are divided are not as prominently so. See for example Annable (1985).

- *Pseudonaja textilis ohnoi* Wells and Wellington, 1985 from Central Australia. Believed to be restricted to the McDonnell Ranges of Central Australia. All divided subcaudals are normal for this taxa as is an unbroken iris.
- *Pseudonaja textilis pughi* Hoser, 2003 from eastern New Guinea and further separated from Australian *P. textilis* on the basis of dentition and juvenile colouration.

The proposition that these taxa should be recognized as subspecies and not full species is supported by the findings of Skinner et. al. 2005 (p. 569).

Generally recognized as being similar to *P. textilis*, but of distinct species are the following taxa:

- *Pseudonaja inframacula* (Waite 1925) from the Eyre Peninsula, SA and along coastal SA across to WA is now regarded to be sufficiently differentiated from *Pseudonaja textilis* and *P. affinis* to warrant recognition as a separate taxa at the species level. This recognition also follows on from an assessment of "*P. textilis*" from nearby areas.
- *Pseudonaja ellioti* Hoser 2003 is a species that was for many years confused with *P. textilis* and is known only from the far west of New South Wales, in the general region of Wilcannia. Differences from *P. textilis* include ventral colouration, eye size, lack of a distinct above eye-ridge and head scalation. Only two museum specimens, the holotype and paratype are known.
- *Pseudonaja affinis* (the Dugite) from south-west WA and nearby parts of SA, is a closely related taxa, long recognised as a different species.

OTHER SIMILAR GENERA AND GENERA RELEVANT TO THIS PAPER

Other genera of similar looking elapid snakes (e.g. *Pailsus*, *Oxyuranus* and *Cannia*) are separated by colouration, build, scalation and other physical characteristics. *Oxyuranus* is separated from *Pseudonaja* by a higher number of mid-body rows (usually 23, see below) and the genera *Pailsus* and *Cannia* are separated by colour (if not "Brown snakes") or mainly single subcaudals if "Brown snakes". *Pailsus* and *Cannia* also lack the distinctive anterior ventral blotches seen in most *Pseudonaja*.

Panacodechis is separated from the similar *Cannia* by colouration, in that adults are generally not "Brown", while *Cannia* are when sympatric with *Panacodechis*, or distinctly reticulated in scale pattern and colour in regions they occur in where colour may not be "brown" and they are not sympatric with any *Panacodechis*. They are also separated by MtDNA and Nuclear DNA properties.

Oxyuranus also have slight keeling of the scales on the neck, which is absent from the other genera of snakes.

Refer to Cogger (2000) and Hoser (1998b) for further information about separating these similar genera.

DIAGNOSIS OF *PSEUDONAJA TEXTILIS*.

For most *Pseudonaja textilis* and others in the species group as identified above, they all tend to share the following characteristics.

In dorsal colour, they may range from light tan, through dark brown, russet and orange to almost black, or any shade in between the preceding. The belly is usually cream or yellowish-orange with scattered darker blotches. Hatchlings vary between localities. However most have a black head and/or black markings on the head and nape, the black bars being either totally or partially divided to form two such bars. The juvenile pattern usually fades at about two years of age. In some specimens of the insular subspecies of *P. affinis tanneri* and *P. a. exilis* the colour change is reversed...light as juveniles and darkening with age. (Maryan and Bush, 1996).

In coastal areas of NSW and nearby places, young specimens are usually banded (black bands) all along the body with rare cases of adults retaining bands. In some areas, including west of Lithgow in New South Wales, young may be born with or without bands, even from the same clutch of eggs.

The species (as identified here) is known from all Australian States, however in the NT, it is only known from the McDonnell Ranges and adjacent areas to the north, including the Barkly Tableland, while a single specimen is known from WA (Gordon Downs, in the Kimberley District). In the other (Eastern) states the species is most common in wetter regions, although within these areas, they prefer open woodland and grassland type habitats, where they are sometimes extremely common and commonly the dominant snake species. The species does not occur in Tasmania, but as climate is not thought to be the sole limiting factor, the underlying reason could be that the species failed to migrate south fast enough following the last ice age before the rise of waters that created Bass Strait.

Unpublished findings by myself, based on a decade of research in Melbourne, indicates that *P. textilis* continues to move southwards in its Victorian distribution range, including around Melbourne, at the leading edge of the southward migration, with the main impediment to the progress of the species being the dominance of other species, (especially the cannibalistic *Austrelaps superbus*) as opposed to any alleged climatic and temperature factors.

In *P. textilis*, the scales are smooth with 17 mid-body rows, 185-235 ventrals, a divided anal and 45-76 paired subcaudals. Occasionally the first (anterior) subcaudals may be single, although in some specimens of *P. textilis bicucullata*, up to ten or more single subcaudals may occur.

In most areas adults average about 1.5 metres, but in Coastal Queensland adults over 2 metres are common. In other regions, outside Queensland, 2 metre specimens do occur, but are regarded as uncommon.

This swift-moving diurnal species will usually flee if aroused, but if cornered will stand its ground raise its head and become highly aggressive which is as described in (Gillam 1979), including the cover image.

P. textilis and related species are highly dangerous taxa with toxic venom.

These species are one of the most common causes of snakebite deaths within Australia.

This reflects the fact that the "species" is tolerant of human habitation and in many areas has actually increased in numbers, particularly around the edges of the capital cities of

Sydney, Melbourne, Adelaide and Brisbane. It is invasive and will move into severely degraded habitat.

The species feeds on vertebrates, including introduced mice (*Mus musculus*). 10-20 eggs are usually laid. Quotes in the literature of higher numbers may be communal laying's involving more than one animal that have been erroneously misinterpreted as single clutches.

Captive breedings here of *P. textilis bicucullata* (twice for the same venomoid female) have yielded clutch sizes of 10 then 8 (one clutch per season/year, with eggs laid every two years only), while dissections of about 10 killed (by the public or roadkilled) adults across 10 years of this subspecies have tended to yield an average clutch size slightly in excess of 10, but ranging to about 16.

Other *Pseudonaja* are separated from *P. textilis* and closely related taxa (named above) by a suite of characters including scalation, and the colour of the buccal cavity (darker in the others, versus flesh colour with only some dark striations).

One of the most closely related taxon to *Pseudonaja textilis* are *Pseudonaja affinis* Gunther 1872 and *Pseudonaja tanneri* (Worrell 1961), (the latter of which is commonly regarded as a subspecies of *P. affinis*), both of which are separated from *Pseudonaja textilis* by having 19, instead of 17 mid-body rows, (Wilson and Knowles 1988).

Skinner et. al. 2005, reject the concept of subspecies of *P. affinis* for the forms found on islands off the western West Australian coast.

However below a subspecies of *P. affinis* is named and the argument in favour of this designation is regarded as compelling due to the consistent trend differences seen.

Photos of *Pseudonaja textilis* in life (as broadly recognized), are provided by Ehmann (1992), Gow (1989), Hoser (1989), and Mirtschin and Davis (1992), Storr, Smith and Johnstone (1986), Worrell (1970) and other authors.

Photos of other relevant taxa are provided in the text references cited at the end of this paper.

THE FORMAT OF THE DESCRIPTIONS OF NEW TAXA

Rather than detailing all previously described taxa in the broadly recognized genus "*Pseudonaja*", I refer readers to the references cited at the end of this paper. This is done for reasons of space constraints in this journal and a desire to avoid unnecessary words in terms of duplicating already known and available information.

In particular, Gillam 1979 separates most described species in the genus *Pseudonaja* (excluding *P. affinis* (and described variants)) and those features are adopted here as diagnostic for those taxa.

Likewise for more recent features as described by Skinner et. al. (2005) that are similarly adopted for all in the genus "*Pseudonaja*". It is therefore accepted that the taxa generally recognized as *P. nuchalis*, comprises at least three well-defined species, all of which have already been formally described and named, if not by Wells and Wellington, then previously.

These are the Southern "*P. nuchalis*" now known as *P. aspidorhyncha* McCoy (1879), that being the first available name under the ICZN rules (see Mengden 1985, p. 200), Orange, with Black head "*P. nuchalis*" (proper name not known) and Darwin "*P. nuchalis*", which retains the name "*P. nuchalis*" (see Mengden 1985, p. 200). There remains a question as to which of the available names should be applied to the Orange, with Black head "*P. nuchalis*", although it is probably *P. acutirostris* (Mitchell 1951). To

ascertain the correct name for this third taxa, an inspection of available holotypes relegated to synonymy with *P. nuchalis* (in the past) needs to be done, although Mengden has done this already. Mengden (1985) wrote later that there were no available holotypes for any of the Darwin, Black-headed or southern morphs of *P. nuchalis* (contrary to his notations on page 200), but this clearly predated the publication and acceptance of Wells and Wellington 1985, which has described and named a plethora of "*nuchalis*" variants, including it seems at least two that fits the Orange, with Black head "*P. nuchalis*".

Of relevance is that Skinner published in January 2009 a paper on "*P. nuchalis*" and stated that he relied on article 24.2.2 of the 1999 ICZN rules, as "First reviser" to designate the Wells and Wellington name *P. mengdeni* to this otherwise not properly named taxon.

His reasoning was somewhat questionable and in essence relied on a personal preference for the person that Wells and Wellington had named the taxon after (Skinner 2009) as opposed to the other person Wells and Wellington named the same taxon after elsewhere in the paper, even though based on page/position priority, at least one other name (as identified by Skinner) did have priority.

However in spite of this situation, the name *P. mengdeni* should be referred to the relevant taxon under the ICZN's principle of stability of nomenclature.

Having said that, taxa as described in Hoser 2003a and Hoser 2003b are recognized here and those definitions are adopted for this paper, including definitions in references cited therein and original descriptions of those taxa.

Gillam 1979 stated that he regarded *P. textilis* as probably comprising several species. This view has been considered by myself, but excluding *P. elliotti* Hoser 2003, no other snakes grouped under *P. textilis* warrant being placed in another species, either named or unnamed. This view is supported by the evidence of Mengden (1985) and Skinner et. al. (2005).

A similar view may be taken in terms of the two populations until now assigned to the species *P. guttata* and the eastern and western populations of *P. affinis*, which while obviously different to one another, are not sufficiently differentiated to be separated at the full species level.

Hence a conservative approach has been taken here with the newly described forms being recognized merely as subspecies of the taxa *Pseudonaja textilis*, *P. affinis* and *P. guttata*.

Hence as a result of Skinner et. al. 2005 (and Skinner 2009, see below) and Hoser (2003), there are now ten well-defined and recognized species within the genus *Pseudonaja* as broadly defined.

These are:

P. affinis, *P. guttata*, *P. modesta*, *P. ingrami*, *P. textilis*, *P. inframacula*, 3 taxa currently assigned to *P. nuchalis* (see above) (*P. aspidorhyncha*, *P. nuchalis* and *P. mengdeni*) and *P. elliotti*.

For many taxa, including those detailed below, colour is often an important and obvious diagnostic tool.

However it's important to note that variations in specimens arise from age, health and position in the shedding cycle, that runs from 4-14 weeks in healthy snakes during active periods.

This does at times make separating taxa on the basis of colour occasionally problematic and hence as a procedure, is

best avoided immediately pre and post slough.

Another variable is degeneration and colour “running” or “fading” in preserved snakes and these should be properly accounted for.

PSEUDONAJA ELLIOTTI HOSER 2003

Note that Skinner et. al. 2005 do not appear to have ever inspected either of the known specimens of *P. elliotti* Hoser 2003 or for that matter even read and referred to the paper Hoser (2003), even though it was known and available to them as of end 2003.

However a post on the EMBL Website at:

[http://srs.embl-heidelberg.de:8000/srs5bin/cgi-bin/wgetz?-e+\[REPTILIA-Species:'Pseudonaja_SP_elliotti'\]](http://srs.embl-heidelberg.de:8000/srs5bin/cgi-bin/wgetz?-e+[REPTILIA-Species:'Pseudonaja_SP_elliotti'])

written by Peter Uetz reads as follows:

“Comment: Likely to be synonymous with *P. textilis* (A. Skinner, pers. comm.).”,

has been on that site since at least end 2004 (since moved to another server).

It is at stark variance with other authors such as Ehmann (1992) who have seen the taxa first hand. Uetz is a close associate of Wolfgang Wüster, in turn a good friend of convicted wildlife smuggler David John Williams, both of whom as a matter of course denies and criticizes anything Raymond Hoser says, regardless of merits, hence giving possible or partial explanation to the Uetz posting.

For example Uetz and Wüster have on their websites repeatedly noted with glee the failure of Cogger 2000 to list any Hoser 1998a *Acanthophis* taxa as valid, including for the New Guinea taxa, which by not being in Australia, would be automatically excluded from Cogger’s books if only on the basis of distribution.

In terms of Cogger and *Acanthophis*, of greater significance is probably the personal animosity between Cogger and Richard Wells, spanning decades, coupled with the fact that one *Acanthophis* (*wellsi*), was named after Wells, causing Cogger some great consternation.

Returning to the issue of Uetz, Skinner and *P. elliotti*, it is important to stress that there is no evidence whatsoever to support the assertion “Likely to be synonymous with *P. textilis*” and hence it should be dismissed as deliberate misinformation designed to create confusion among persons who’d know no better.

Photos of holotype *P. elliotti* published online at: <http://www.smuggled.com/pssetex3.htm> and elsewhere, including comparative shots with *P. textilis* from the same region, clearly shows the two are very different species. This would even be obvious to a lay person with little if any knowledge of snakes, let alone a scientist!

SKINNER 2009 AND THE OMISSION OF PSEUDONAJA ELLIOTTI

More notable is that Skinner (2009) lists all known *Pseudonaja* taxa, including known synonyms (or available names deemed junior synonyms of other taxa and/or nomen nudem). However excluded from his otherwise comprehensive treatment for the genus is *Pseudonaja elliotti* Hoser 2003 by means of any form of notation or reference.

Again based on the comments on the Uetz database website (cited above), it would appear that Skinner would have been aware of the taxon, or at least the description of the “purported taxon” if one took a negative view of the paper naming the taxon.

Certainly myself and fellow herpetologists Scott Eipper and

Adam Elliott have been in regular contact with Skinner and co-workers, including supplying him with DNA material as cited in his 2009 paper and had referred him to the 2003 *Pseudonaja elliotti* description paper, meaning it’d be effectively impossible for him not to know of the paper.

Upon becoming aware of the Skinner 2009 paper, I e-mailed Skinner a request for the paper, on 9 Jan 2009, which was sent by him to me within days. After reading the paper and noting no references to *P. elliotti*, I sent him an e-mail on 12 January 2009 seeking answers to the obvious question.

The text read:

“Adam, thanks for the paper.

I just read it all and yes, it makes general sense, except for one

very important omission and that was “*Pseudonaja elliotti*” Hoser 2003.

Was there a reason for that?”

No reply was received and so a second e-mail was sent late in January, which in full is copied below:

“Subject: *Pseudonaja elliotti*

Date: Wed, 28 Jan 2009 19:21:55 -0800

From: Raymond Hoser
<adder@smuggled.com>

Organization: Snakebusters - Australia’s Best Reptiles

To: adam.skinner@adelaide.edu.au

BCC: adam@upmarketpets.com, R VHS Scott Eipper 1 <scott_eipper@hotmail.com>, scott_eipper@hotmail.com

Adam, I don’t know if you got my earlier e-mail querying you on the

taxon, but the questions I never got answers to were as follows:

1 - Is there a reason it was ignored in your 2009 *Pseudonaja* paper?

2 - Have you looked at any of this taxon?

Please let me know

Thanks again.

RAYMOND HOSER”

Skinner did not answer the e-mail, in spite of it being sent several times to the same address that got his prompt replies earlier.

In other words, it becomes uncertain whether or not the Uetz site comments are actually Skinners or alternatively another fraud perpetrated by Wüster, which would be in line with his general behavior and methods.

Another question arising, is why was Skinner now apparently dodging answering some very logical questions arising in the wake of the 2009 paper?

Regardless of how the comments attributed to Skinner got to be on the Uetz website, at the end of it all, the only issue of relevance is whether or not *P. elliotti* is a valid taxon at the species level and put simply, based on apparent sympathy with *P. textilis*, the undeniable evidence shows it is!

THE TRUTH HATERS

While referring to Wolfgang Wüster and close associates, Mark O’Shea, Bryan Fry and David Williams, mention should be made of their scandalous habits of continually criticizing all Hoser papers while at the same time bootlegging the key

findings under the guise of “original research” and then publishing them in various journals that they usually have some sort of editorial control.

Then they set about making the findings out to be their own original findings, cross citing them among themselves, cross-referencing to earlier papers also bootlegging material from Hoser and continually claim credit for findings not their own.

As a rule they consistently refuse to cite the original work of Hoser as it predates their own poor quality papers, save perhaps for a baseless and scandalous attack through an internet chat forum or print journal in which they exercise editorial control and where balancing corrections can be forcibly removed or prevented.

Threats against journal editors have been made by Wüster and/or friends in writing by letters to the editors or even on internet chat forums that they control and as recently as mid 2008.

Editors and journals threatened by these people include from herpetological societies in Australia, the UK and the USA.

This plagiarism of work by these men and their other illegal and unethical acts should be made as widely known as possible and they should be condemned for this.

They are not doing herpetology, science or wildlife conservation any services at all with their unethical activities that they try to masquerade as “science”.

Plagiarisation (otherwise known as uncited theft of another person’s work by failure to cite, then take credit for it) is one of the most contemptible acts of any so-called scientist.

An example of one of these sorts of papers is seen in Wüster et al. (2004), where they supposedly investigate the phylogeny of snakes in three genera, namely *Acanthophis*, *Oxyuranus*, and “*Pseudechis*”, making findings similar to those of three earlier papers on the taxonomy of all three genera by Hoser and yet failing to properly cite or acknowledge the original Hoser findings and papers (namely, Hoser 1998a, 2000a and 2002).

That paper included for example the deliberate and scandalous failure to cite the definitive paper of Hoser 1998, that was the first to give a genus wide assessment and revision of *Acanthophis* taxonomy, which of course made similar findings to those these men were now claiming as their own discoveries. And that’s before one looks at the many other similar papers on the relevant genera published in the previous decade by Hoser, that had caused the same men to bombard the internet with their own and “anonymous” postings deriding the Hoser findings as wrong and all Hoser taxa as “nomen nudem” when they in fact complied with the ICZN code in every case!

In this and later papers by the same authors, the men repeatedly make false claims of originality of findings made in terms of these three genera by themselves and at the same time continue to claim that the same earlier findings as made by Hoser and published years earlier are either wrong or lack evidence.

There is no doubt that following publication of this paper, these three men will seek to attack the key points of the paper via internet sites they control, including under multiple identities. Readers are advised to treat all such attacks with the disdain they deserve.

See Hoser (2001) and Hoser (2012) for numerous other examples of these men’s scandalous behavior, dishonesty and even scientific fraud, including direct quotes and citations of the offending material.

Perhaps brief mention should also be made of David John Williams (with serious convictions for wildlife smuggling and animal cruelty offences).

In early 2008, Williams was disqualified from an Accor Holiday Inns competition whereby a person nominates himself as an “everyday hero”, with Williams making outlandish claims about himself allegedly saving lives in New Guinea.

Wüster, O’Shea and Williams encouraged people to rig the votes in favor of Williams, via the registration of e-mail addresses, multiple votes and the like so that he eventually received thousands of votes he wasn’t entitled to, including many from the same IP Addresses, either his own, or effectively controlled by him.

The main basis of this was apparently false “yahoo mail” and other e-mail accounts they spent many hours registering and posting under.

As a result of this blatant dishonesty on the part of Williams and his associates, he was quite properly disqualified from the competition for vote rigging.

Also in 2007/8 Williams was involved in a scandal, whereby vials of snakebite anti-venom went missing in Papua New Guinea, the result being lives were lost due a lack of anti-venom. After the scandal broke it was revealed in March 2008 by respected Port Moresby pharmacist Richard McGuinness that David Williams himself had accessed and taken over 50 vials of anti-venom even though he is not and never has been a licenced qualified medical practitioner authorized to take and use these.

At several hundred dollars a vial in a country with little money and income, this represents a huge quantity and loss for the citizens of the country.

Williams was also a principal of Austoxin, his business that was operating in New Guinea and wound up in 1996 after it was revealed it was the biggest illegal wildlife smuggling racket in the country (PNG).

In March 1997, he was fined \$7,500 with conviction for a series of culpable wildlife trafficking, possession and cruelty charges in the Cairns Magistrate’s Court.

NAMING NEW TAXA AT THE SUBSPECIES LEVEL

For several reasons, it is important that unnamed taxa be formally named and that process is done here. A diagnosis of the species broadly known as *P. textilis* is given in Hoser (1989) and in more detail in Cogger 2000. For diagnoses of the species *P. affinis* and *P. guttata*, including separation from others in the genus “*Pseudonaja*”, refer to the original descriptions, Cogger (2000), Gillam (1979), Skinner et. al. (2005), Storr, Smith and Johnstone (1986). Definition of subspecies within the species *P. modesta*, has been deferred indefinitely pending an ongoing study by Skinner et. al. (see Skinner et. al. 2005), a taxon also being investigated in 2012 by Scott Eipper.

The genus *Oxyuranus* is diagnosed by Cogger 2000 and the species *scutellatus* defined by authors as cited at the end of this paper.

The genus *Panacedechis* is diagnosed by Wells and Wellington 1985 and other authors, with the taxon *papuanus* being further defined by papers by authors as listed and cited at the end of this paper.

In the event that a subsequent worker decides that any two taxa named below are one and the same, then the first named taxa (in order in this paper) is to be the correctly assigned name by any “first reviser” under current ICZN rules.

Where allowable under the ICZN rules, superfluous descriptive information is generally omitted, with readers directed to seek reference from the designated holotypes and/or other specimens of the named taxa.

This has been done as a result of a desire to make this paper more readable and read by potential readers.

There is also a desire to keep this paper restricted to the most important and essential details.

Appropriate descriptions and diagnoses of the various new taxa follow:

PSEUDONAJA TEXTILIS CLIVEEVATTII SUBSP. NOV.

Holotype

A specimen from the Central Australian Museum, specimen number R546, collected at Wave Hill in the Victoria River District, NT, 17°27'S, 130°50'E.

Diagnosis

Adult *Pseudonaja textilis cliveevatti* subsp. nov. are a darkish olive-brown dorsally with the fore body and head darker than the rest of the body. All other N.T. *P. textilis* are the same colour along the entire dorsal surface in adult snakes.

In *Pseudonaja textilis cliveevatti* subsp. nov. each dorsal scale is darker brown tipped. Markings on the venter are not necessarily as distinct as for other *P. textilis*.

Pseudonaja textilis cliveevatti subsp. nov. is restricted to the southern half of the Victoria River District, NT and adjacent parts of WA. A single specimen is known from Gordon Downs, WA. The colouration of adults of this taxa, separate them from other *P. textilis* in the Northern Territory (adjacent regions).

Pseudonaja textilis cliveevatti subsp. nov. is also separated from other *P. textilis* by distribution and is the only subspecies to range into Western Australia.

Etymology

Named in honour of barrister Clive Andreas Evatt from Sydney, NSW. Unlike most lawyers who do nothing more than lie, cheat and thief, Clive is a man of ethics and honour. He has taken on a number of important public interest cases at huge personal cost that otherwise may not have been litigated.

Of particular relevance to private reptile keepers, in 1996 Evatt and fellow lawyer, Michael Rollinson (see below) successfully fought the NSW National Parks and Wildlife Service (NPWS) and allies in three cases in the NSW Supreme Court to ban the newly published book, *Smuggled-2*. As a result of the good work of Evatt and Rollinson in making sure the public got to read the truth about wildlife trade in Australia, the attempts to ban the book failed (the last case finalized on 24 December that year and widely reported in the media at the time).

As a result of the publicity and the fact that the book was now legally being sold Australia-wide, the book became a best-seller and as a direct result of the publication of the book, the NSW and WA governments were then forced to remove more than 20 year-old bans on legal private ownership of reptiles, which came to fruition the following year (1997) in NSW and shortly thereafter in WA.

PSEUDONAJA TEXTILIS LESWILLIAMSII SUBSP. NOV.

Holotype

A specimen from the Northern Territory Museum, specimen number R5205, collected at Anthony's Lagoon, Barkly Tableland, NT, 17°59'S, 135°42'E.

Paratype

A specimen from the Northern Territory Museum, specimen number R5203, collected at Brunette Downs, NT, 18°39'S, 135°17'E.

Diagnosis

Pseudonaja textilis leswilliamsii subsp. nov. is separated from other *P. textilis* by the fact that the iris is consistently a broken circle and that unlike the taxa *Pseudonaja textilis cliveevatti* subsp. nov. (see this paper) *Pseudonaja textilis leswilliamsii* subsp. nov. is the same colour along the entire dorsal surface (in adults).

The iris colour is reddish-yellow with a narrow very pale inner edge. The iris width is about .08 of the eye diameter as opposed to .03-.06 in *P. textilis ohnoi*, which is the other subspecies found in the same general region, which is a consistent shade of brown along its entire dorsal length. In *P. textilis ohnoi* the iris is usually an unbroken circle.

Pseudonaja textilis leswilliamsii subsp. nov. is the only subspecies of *P. textilis* found on the Barkly Tableland, NT. It is separated from other N.T. *P. textilis* by the following traits: consistent dorsal colour to separate from *Pseudonaja textilis cliveevatti* subsp. nov. and broken iris to separate from *P. textilis ohnoi*.

Etymology

Named in honour of Les Williams, a herpetologist from Ballan, on the outer-western outskirts of Melbourne, Victoria, Australia, for his long-term work with wildlife conservation and education.

In late 2007, he was diagnosed bowel cancer. Later he was found to have various secondary tumors and it had been hoped that he'd receive recognition while still alive. This paper was originally scheduled to be published in *Crocodylian* in mid 2008, but pressure was applied on the editors by truth-haters Mark O'Shea and David Williams, the result being the paper was "held over" pending the deletion of material that in any way adversely named truth haters David Williams and others, even if by way of peripheral reference. O'Shea even provided a sizeable "junk" article to fill the huge gap from the omission of this paper.

In the first instance it was agreed to investigate the possibility for such material being removed. However with the publication of the end 2008 issue of *Crocodylian* being delayed to mid 2009, due to unconnected circumstances (the editor resigned due to increased work commitments at his new pet shop, and no other editor had been appointed), it was decided to amicably withdraw the paper from *Crocodylian* and submit an uncensored version of this paper to *Australasian Journal of Herpetology* where it now appears in 2012. Unfortunately Les Williams died in January 2009, before he could see the publication of this paper and the recognition for his life-long work with reptiles and their conservation.

Les Williams was not just a magnificent reptile handler and conservationist. He was also a truly wonderful human being who had a natural way with others including skills at teaching that others in similar roles could never match.

Williams continued free-handling his elapids to just days before his death, but it was the cancer that killed him, not any snakebites.

PSEUDONAJA TEXTILIS ROLLINSONI SUBSP. NOV.

Holotype

A specimen lodged at the National Museum of Victoria on 16 April 2008, by Raymond Hoser, specimen number: D.73622.

The snake is an adult male with 17 mid body rows, 190 ventrals, 59 strongly divided subcaudals (none single), 6 supralabials and 7 infralabials. It was caught live as a young Adult by Ian Renton, of "Snake-away" from Paradise, SA. The snake was acquired by myself in Melbourne shortly after capture in November 2005 and made "venomoid" on 6 Feb 2006, using the method described by Hoser (2004) and later papers.

It was offered a mouse immediately after the operation which it ate voluntarily, and likewise in days following the operation.

This is merely reported here as routine, and noting the minimal pain and discomfort from the operation in sharp contrast to the malicious and deliberate lies peddled on the internet by persons such as Shane Hunter, David Williams and associates.

The snake failed to show any interest in mating with an adult female of the same taxon acquired at the same time and venomoided on the same date.

The male (the holotype) died suddenly on 20 September 2007. The cause of death was believed to be movement of a microchip inserted in March the same year.

The risks of microchip movements in snakes are well-known and such is common.

As a result of these known risks, none would have been placed in any Hoser snakes under normal circumstances.

As part of the long running anti-Hoser campaign by convicted smuggler, David John Williams and associates, these men managed to convince the Department of Sustainability and Environment (DSE) to direct (under threat of prosecution under the Wildlife Act 1975) myself to microchip all "venomoid" snakes.

This was done and as a result of this culpable direction by the DSE people, this snake (and about 40 others) were microchipped.

The corpse was lodged "entire" at the National Museum Victoria as the holotype for this newly described taxon.

As of the time of writing the final draft of this paper in early 2012, the female remained alive and well at the author's facility, having successfully produced her third clutch of eggs just a few months earlier, with all 13 hatching about 8 weeks later incubated at about 29 degrees celsius without incident.

Both these snakes (and a regularly breeding pair), were depicted on the front cover of the Melbourne *Herald-Sun* newspaper on 13 February 2007 (Higginbottom 2007) also leading Williams and associated truth-haters to complain, including writing a letter to the *Herald-Sun* making further false and defamatory claims against myself and the venomoid snakes.

Paratype

Specimen number 73532, from the Field Museum of Natural History, Chicago, USA, collected from south-east South Australia.

Diagnosis

This taxon is most readily separated from all other *P. textilis* by it's relatively narrow rostral scale, that is relatively speaking and on average, is considerably narrower than is seen in all other *P. textilis*.

Pseudonaja textilis rollinsoni subsp. nov. is a smallish form of *P. textilis* restricted to the Adelaide hills and nearby regions of South Australia, including Adelaide city. It is the only subspecies known from this part of state, with *P. textilis* as a species being absent from most parts of South Australia, except the settled south-east.

Although the distribution of *Pseudonaja textilis rollinsoni* subsp. nov. abuts that of *P. textilis bicucullata* in western New South Wales and Victoria, *Pseudonaja textilis rollinsoni* subsp. nov. is similar in many respects to *P. textilis* from northern Australia and also specimens from the coast of NSW. It is substantially different in form from *P. textilis bicucullata* from Victoria and adjacent parts of inland NSW (that is, specimens from Melbourne and the Western slopes and plains of southern NSW).

Pseudonaja textilis rollinsoni subsp. nov. is separated from all other *P. textilis* by it's generally smaller venom glands (about ½ the size of those seen in *P. textilis bicucullata*) and an average venom yield of about 1/3 that of northern Australian *P. textilis* (including all other described subspecies of *P. textilis*).

The relative smallness of the venom glands in *Pseudonaja textilis rollinsoni* subsp. nov. is both a function of the smaller average size of this taxon and also relative at a given (same size) of specimens.

On average snakes of this taxon have smaller narrower heads and more gracile builds than other *P. textilis*.

In line with all other *P. textilis*, save for *P. textilis bicucullata* (on many occasions), *Pseudonaja textilis rollinsoni* subsp. nov. will constrict or hold it's prey in several coils immediately after striking it (as a rule).

Pseudonaja textilis rollinsoni subsp. nov. is typically faster moving and more highly strung (inclined to strike and bite) than *P. textilis* from other parts of Australia.

Ventrally, *Pseudonaja textilis rollinsoni* subsp. nov. has a particularly well-defined pattern of blotches and marks on the forebelly, which is on average better defined than in other regional variants of *P. textilis*. (*P. textilis bicucullata* (in most specimens) has the least well defined ventral pattern of the various named subspecies).

The rear belly of *Pseudonaja textilis rollinsoni* subsp. nov. is typically a reddish brown colour, as opposed to a creamish brown seen in most specimens of other subspecies of *P. textilis*, making this feature another character diagnostic of this subspecies.

All specimens of *Pseudonaja textilis rollinsoni* subsp. nov. have divided subcaudals, which is in contrast to *P. textilis bicucullata* (found in Victoria and NSW) which commonly has one or more anterior subcaudals single.

Distribution is a good means to identify *Pseudonaja textilis rollinsoni* subsp. nov. as it is the only *P. textilis* known from the north Adelaide region of South Australia, but it is uncertain how far, north and east of this region this taxa extends beyond the Adelaide Hills area.

Due to different ventral scalation and colouration, *Pseudonaja textilis rollinsoni* subsp. nov. is easily separated from *P. textilis bicucullata*. *Pseudonaja textilis rollinsoni* subsp. nov. is separated from all other *P. textilis* by it's relatively smaller venom glands, rear ventral colouration (more reddish brown than other *P. textilis*), more gracile build and generally faster movements.

CAPTIVITY NOTES

As captives, *Pseudonaja textilis rollinsoni* subsp. nov. are regarded by most keepers as intractable in that they do not tame down and remain aggressive to humans.

This is not strictly the case, but appears to be more true for this subspecies than other *P. textilis*.

A wild caught pair including a male and female specimen received from Adelaide at end 2005 (caught three weeks

prior) remained highly strung and aggressive for some weeks, but fed and thermoregulated like perfectly well-adjusted captives from within 48 hours of being placed in cages at my facility.

Both were made venomoid (see Hoser 2004 and Hoser 2005) in late 2005 and had incident free husbandry until late 20 September 2007, when the male in apparently perfect health, died suddenly and without warning or obvious explanation. It was found on its back, indicating a painful and sudden death.

An inspecting veterinary surgeon advised that the likely cause of death was movement in a microchip implanted in March 2007 under duress by us and on direction of the State Wildlife authority (called the Department of Sustainability and Environment, or DSE) under threat of prosecution for non-compliance.

The order to microchip was made following an online petition against Hoser venomoids orchestrated by Williams, Wüster and associates, whose sole agenda was against Hoser and reptile conservation in general combined with their non-stop complaints to DSE and other authorities leading DSE officials to complain that they had to act "to be seen to be doing something".

Ironically, while the online petition and associated website made false claims against the Hoser venomoids, including that false allegation that mouths were superglued to prevent bites, and claimed animal welfare as the basis of the campaign against Hoser, contrary to animal welfare protocols, the snakes were forcibly microchipped for no good reason or benefit to the snakes and with total disregard for welfare considerations.

While potential movement of micro-chips in chipped snakes hasn't been monitored in the over 40 snakes microchipped (most of which remain alive and well), some movement of chips has been casually observed either directly, or during subsequent scans of snakes showing chips to have moved to locations other than where implanted.

No other wildlife demonstrators in Victoria (about 40 licenced) were directed to jeopardize the welfare of their snakes or forced to microchip any of their elapid snakes.

The direction to forcibly microchip the snakes was in violation of the Wildlife Act Victoria (1975) and the Prevention of Cruelty to Animals Act Victoria, which prevents any act of pain or suffering to be inflicted on an animal without measurable health and welfare benefits.

As of early 2008, the female *Pseudonaja textilis rollinsoni* subsp. nov. remained in good health.

Contrary to false claims made by Wüster, Williams, Fry, O'Shea and/or their friends on the internet and elsewhere, there was no regeneration of venom or venom glands in the deceased male snake (mentioned above) or other Hoser venomoids long after the operation.

Videos were made in early 2008, including by *The Age* newspaper on 9 April 2008 of long-term venomoids, including *Pseudonaja textilis* and Inland Taipans (*Parademansia microlepidota*) being forced to bite myself to prove that the snakes have no venom and the bites have no ill-effects.

BREEDING

A male *P. textilis bicucullata* was as of end December 2005 trying to mate with a female *P. textilis bicucullata* and after three days was unable to connect, in spite of non-stop trying.

This snake was placed with the female *Pseudonaja textilis rollinsoni* subsp. nov. but showed no interest in mating her.

The reaction between the two snakes was more akin to that seen when different taxa are mixed (as in Tigers and Browns), which is something I've been able to do because most snakes at my facility are venomoid (see Hoser 2004 or Hoser 2005).

With time, it is possible to have *Pseudonaja textilis rollinsoni* subsp. nov. and all other *P. textilis* so tame that they can be "free-handled" without biting, but this is only recommended for venomoids.

While most *Pseudonaja textilis rollinsoni* subsp. nov. are smallish (average under 1.2 metre as adults), specimens up to 2 metres are known.

The male did not show any interest in mating with the female at any stage, in spite of the same husbandry regime resulting in repeated successful breedings of *P. textilis bicucullata* at the same facility. This was the case for the entire time the snake was kept and in spite of a good overwinter cooling for this and other elapids at the facility.

The male was inspected in Aug/Sept 2007 and seen to be producing viable semen, that was inspected under a microscope and cleared as viable with active motile spermatozoa.

It was hoped to trial artificial insemination on these snakes using the method detailed in Hoser 2008a. However the unexpected death of the male on September 2007 prevented this from occurring.

The same method of artificial (or assisted) insemination did however succeed in producing other newborn reptiles, including Tiger Snakes and Eastern Bluetongues in a world first.

(In the same 2007/8 breeding season, the Hoser facility produced Blotched Bluetongues and a second litter of Tiger Snakes by "Natural" means).

Etymology

Pseudonaja textilis rollinsoni subsp. nov. is named in honour of barrister Michael Rollinson from Sydney, NSW. Unlike most lawyers who do nothing more than lie, cheat and thieve, Michael is a man of ethics and honour. Often working closely with Clive Evatt, he has taken on a number of important public interest cases at huge personal cost that otherwise may not have been litigated, see above.

PSEUDONAJA TEXTILIS JACKYHOSERAE SUBSP.NOV.

Holotype

Specimen number R147652 from Merauke, Irian Jaya, Lat 8° 30' Long 140° 20', at the Australian Museum, Sydney, lodged by J. Scott Keogh in 1995.

Paratype

Specimen number R147659 from Merauke, Irian Jaya, Lat 8° 30' Long 140° 20', at the Australian Museum, Sydney, lodged by J. Scott Keogh in 1995.

Diagnosis

There are consistent differences in colour between *Pseudonaja textilis pughii* Hoser 2003 populations from eastern PNG and *Pseudonaja textilis jackyhoserae* subsp. nov. from Merauke.

Pseudonaja textilis jackyhoserae subsp. nov. are olive or tan or mid-brown, whereas *Pseudonaja textilis pughii* Hoser 2003 tend to be a distinct dark grey-brown to almost black.

Pseudonaja textilis jackyhoserae subsp. nov. is the Eastern Brown Snake known from Merauke and nearby areas of island New Guinea in the territory of Indonesian Irian Jaya.

It is separated and clearly different to the eastern New

Guinea populations, originally described and known as *Pseudonaja textillis pughii* Hoser 2003. *Pseudonaja textillis pughii* Hoser 2003 is apparently separated from this newly described subspecies by distribution.

The present-day swamplands of the Gulf of Papua coast appear to be a barrier separating the two subspecies populations. (The same area apparently acts as a barrier between the two distinct forms of Taipan found in island New Guinea as well).

At the time of the description of *Pseudonaja textillis pughii* Hoser 2003, it was assumed that all Eastern Brown Snakes from island New Guinea would as a matter of logic be assigned to the taxon on the theoretical basis that the taxon would have unfettered access across the island. In Australia, the species ranges across various habitats and great distances, including habitats comparable with those evident in New Guinea.

However investigations by this author into Taipans from island New Guinea, revealed two distinct forms (namely that from most of southern Papua, versus that from Merauke, Irian Jaya and nearby (being the entire range of Taipans to include the area west of the Fly River drainage in PNG), the latter form being in some ways more closely related to those from northern Australia, as opposed to *O. s. canni*, which should herein be used only for the population east of the Gulf of Papua).

The differences between the eastern and western Taipans in island New Guinea are sufficient to warrant separation at least to the subspecies level and hence the unnamed western taxon is named formally below.

Similar inquiries into the *P. textillis* from Merauke, Irian Jaya, led to the inescapable conclusion that these snakes are sufficiently different from the eastern snakes to be regarded as a different taxon, at least to the subspecies level, hence the naming of the taxon *Pseudonaja textillis jacksyhoserae* subsp. nov..

Noting the physical position of Cape York and north-west Australia to island New Guinea, in combination with the position of the gulf of Papua, questions arise in terms of the origins of the New Guinea populations of *P. textillis* and *O. scutellatus* and whether they arose at the same time.

One scenario proposed is that for these genera two separate migrations occurred to New Guinea at the same time, and during the last ice age, (the Pleistocene) ending within the last 12 thousand years, perhaps across two separate land bridges. An alternative scenario is that the origins of the snakes east of the Gulf of Papua predate the end of the last ice-age. That is that those snakes derive from earlier stock and an earlier "invasion", hence their sharper differentiation from known and present Australian stock. This implies that the latter stock as seen near Merauke in Irian Jaya crossed to the region either near Cape York or west of there from Australia, including perhaps north-west Australia, but failing to invade the area east of the Gulf of Papua.

Until the discovery and description of *Pailsus rossignollii* Hoser 2000, the closed forests near the Gulf of Papua was not considered to be a significant physical barrier to the movement of savannah dwelling Australasian snakes (as was the case for the central range of New Guinea), long known to split taxa (see for example Kluge 1974 in his discussion of *Lialis jicari*). However for some taxa it clearly is, thereby explaining for example the absence of *Pailsus* from suitable habitats in places like Port Moresby.

Noting that other "Australian" reptile taxa with similar habitat

requirements to *Pseudonaja* and *Pailsus* have apparently breached the Gulf of Papua and are found on both sides, it may be prudent to investigate these to see if there are significant differences between the specimens in the eastern and western populations as a result of an isolation likely to be many thousands of years.

Finally, both O'Shea 1996 and Williams et. al. 2005 alleged that Eastern Brown Snakes in island New Guinea are feral and introduced to the island by humans during the second world war.

These claims are rebutted and patently ridiculous as evidenced by the wide distribution of both New Guinea subspecies, including in areas away from inhabited regions and in numbers not possibly explained through natural breeding in the post World War Two period.

OTHER AUSTRALIAN "PSEUDONAJA"

A notable point in terms of *Pseudonaja textillis jacksyhoserae* subsp. nov. is it's relative abundance where it occurs. This is in stark contrast to the relative rarity and patchy distribution of *P. textillis* in adjacent parts of northern Australia, including Cape York and the Northern Territory.

The contrast presumably relates in terms of competing species, some of which appear to be lacking in New Guinea.

While Hoser 2001 noted the absence of *Cannia australis* in New Guinea as a major factor relating to the abundance of *Pailsus rossignollii*, another factor in terms of *Pseudonaja textillis jacksyhoserae* subsp. nov. is probably the absence of *Pseudonaja nuchalis* (of any of the three Australian "forms" or "species") in New Guinea. Noting that in Australia, *P. nuchalis* is strong in the top-end but *P. textillis* is not, it'd be reasonable to assume that where both species cohabit, they compete directly, with *P. nuchalis* (relevant form/s) apparently having the upper hand in most areas they compete in the dry tropical habitats, including as seen around Merauke and elsewhere in New Guinea, where fortunately for the *P. textillis*, the *P. nuchalis* (all forms) never made it to.

As to why the *P. nuchalis* never made it to New Guinea, one can only guess, although the most logical conclusion would be that the species arrived in northern Australia after sea levels had risen (post 11,500 YBP).

An alternative but less likely explanation could be that *P. nuchalis* died out after arriving on the New Guinea side of Torres Strait.

Questions relating to widely distributed Australasian snakes found only on one side of Torres Strait.

Similar questions and conclusions may be drawn for other Australian taxa, including for example the Black-headed Pythons (*Aspidites melanocephalus*), common to the top end of Australia, but absent from New Guinea. This would lead to the inevitable conclusion that the taxa is recently derived from stock further south, as in where Womas (*A. ramsayi*) presently inhabit, with the less likely alternative being that specimens from southern New Guinea died out after the land-masses were divided by rising seas.

Conversely, the absence of widely distributed (in southern New Guinea) *Leiopython hoserae* from Australia raises similar questions, including in terms of it's origins.

Did these snakes derive from stock from north of New Guinea (where the similar *Leiopython albertisi* occurs)? Did *Leiopython hoserae* arrive in southern New Guinea before sea levels began to rise, sometime after 11,500 years BP (BP = before present)?

Noting that the differences of *L. hoserae* versus *L. albertisi*

are significant and based on geological/distributional evidence and morphology differences that show likely presence of *L. hoserae* in southern New Guinea for millions of years rather than thousands, the question remains, why aren't they in northern Australia?

Besides *Aspidites*, another obvious competitor in northern Australia not in New Guinea is the elapid taxon, *Cannia australis*.

Hence *L. hoserae* or it's precursor may have at one time also inhabited what is now northern Australia.

Etymology

Pseudonaja textilis jackyhoserae subsp. nov. is named in honour of my daughter, Jacky Hoser, aged 7 in 2008, who has already made a great contribution to wildlife conservation through her work in educational reptile shows by our company Snakebusters. In several years of handling the world's five deadliest genera of snakes, she has never had a bite from any, indicating a general lack of skill by so-called "snake handlers" many years her senior, who have made countless trips to hospitals to deal with snakebites and serious life-threatening envenomations.

PSEUDONAJA GUTTATA WHYBROWI SUBSP. NOV.

Holotype

Specimen number R4646 from the Northern Territory Museum, collected from Anthony's Lagoon, NT, 17°59'S, 135°32'E.

Paratypes

Specimen number 1502 from the Central Australian Museum, collected from Brunette Downs, NT, 18°39'S, 135°57'E, and specimens numbers 3217 and 3218 both from the Central Australian Museum, collected at Brunette Downs/Alroy Downs Boundary, NT, 19°05'S, 136°10'E.

Diagnosis

Pseudonaja guttata is a taxa with a dominantly black buccal cavity.

It is separated from other "*Pseudonaja*" where it occurs by the mid-body scale row count (19 or 21 in *P. guttata*, versus 17 in other relevant taxa)

See Cogger (2000), Skinner (2005) and Gillam (1979) for a more detailed diagnosis of this taxa as compared to similar species in the Northern Territory and nearby Queensland.

Pseudonaja guttata whybrowi subsp. nov. is separated from *P. guttata guttata* (Holotype from Winton, Qld, 22°19'S, 143°03'S) by the following suite of characters.

Mid body scale rows are consistently 19 and this taxa is restricted to the Northern Territory.

There is a gap in the distribution of *P. guttata* between Avon Downs, NT and Lorna Downs Queensland. The NT population is hereby assigned to the taxa *Pseudonaja guttata whybrowi* subsp. nov. while the Queensland population is hereby assigned to *P. guttata guttata*.

The distribution gap is a useful means to separate the two subspecies, but is not the only way to be able to do so.

Queensland *P. guttata* differs from *Pseudonaja guttata whybrowi* subsp. nov. in terms of several character states including that almost all specimens have 21 mid body rows (vs 19).

Pseudonaja guttata whybrowi subsp. nov. has on average a lower subcaudal count than for Queensland *P. guttata*. Gillam 1979 cites 44-50 (Mean 47, N=10) in what is herein named *Pseudonaja guttata whybrowi* subsp. nov. versus 48-59

(mean 54, N=15) from Queensland *P. guttata*.

The taxon *Pseudonaja guttata whybrowi* subsp. nov. is little known in the wild, save for a handful of anecdotal reports. Captives have been maintained for years on a dominantly rodent diet and breed with little difficulty. Due to their venomous nature they are not a popular captive, but due to their relatively even temperament (In terms of other "*Pseudonaja*") and often banded adults, they are probably the most sought-after "*Pseudonaja*" in the "pet trade".

Etymology

Named in honour of herpetologist Pete Whybrow, who has made a valuable contribution to herpetology in Australia. It is unfortunate that his head is so large that when his wife Judy gave birth to his child (named James) the baby's head was so large that an assisted birth was necessary.

PSEUDONAJA AFFINIS CHARLESPIERSONI SUBSP. NOV.

Holotype

A male specimen at the "Australian National Wildlife Collection", Canberra, number R1968 collected in August 1970 from 25 miles (40 km) east of Ceduna, SA., Lat 32.18, Long 134.03.

The specimen has 56 subcaudals (all divided), and the middle part of the specimen is also missing, from below the heart region to just above the venter.

Diagnosis

Pseudonaja affinis charlespiersoni subsp. nov. are separated from *P. affinis affinis* (and other WA *P. affinis*) by the following characters. *Pseudonaja affinis charlespiersoni* subsp. nov. typically possess 17 as opposed to 19 mid-body rows. Furthermore the rostral scale is usually large and conspicuous in dorsal view, as opposed to being scarcely visible from above as in WA *P. affinis*.

Pseudonaja affinis charlespiersoni subsp. nov. is restricted to SW South Australia.

P. affinis are separated from similar taxa (*P. textilis* and *P. inframacula*) by the possession of a dark grey throat, contrasting with a paler ventral surface, whereas *P. inframacula* typically have a dark grey belly, while *P. textilis* lack the dark grey throat.

Etymology

Named in honour of Charles Pierson, best known as a publisher of numerous high quality educational books. In 1989, he published my book *Australian Reptiles and Frogs*, in 1991, the definitive *Endangered Animals of Australia*. Most notably however he literally put everything he owned on the line and lost it all, when in 1993 he published the groundbreaking *Smuggled: The Underground Trade in Australia's Wildlife*. The book was illegally banned by the NSW National Parks and Wildlife Service (NPWS), who a month later were forced to lift the ban as a result of media publicity. This ban and the legal costs involved in overturning it, were what sent Pierson broke and forced him to ultimately sell his property in the Sydney suburb of Mosman.

The book did however become a best seller and as a direct result of that book and the later *Smuggled-2*, published in 1996, private individuals in Australia were for the first time ever, allowed to keep live reptiles as pets and for study, regardless of where they lived. In NSW in particular, prior to the publication of the books, anyone who dared attempt to keep reptiles as pets would be subjected to armed raids, and jail, even for reptiles as common as Bluetongues (Genus *Tiliqua*). The same situation seen in Western Australia was

also reversed as a direct result of the *Smuggled* books.

Everyone who in the 21st Century who keeps reptiles as pets in a private capacity, owes Pierson an eternal debt of gratitude for his courage in publishing the book *Smuggled*.

GENUS OXYURANUS

Hoser (2002) detailed the then known species and subspecies of "Taipans", including the formal description of the taxon from north-west Australia. Following on from the taxonomy of Covacevich, J., McDowell, S.B., Tanner, C. and Mengden, G.A. (1981), and most authors since then, Hoser (2002), kept the species *microlepidota* in the genus *Oxyuranus*, relying on that diagnosis.

While that taxon is clearly related to other Taipans (other *Oxyuranus*), it is now my considered view that the differences in the taxon *microlepidota* are sufficient to warrant its placement in another genus. The available name under the ICZN "Rules" for this placement is *Parademansia* Kinghorn 1955.

The decision to remove *microlepidota* from *Oxyuranus* comes from the benefit of having specimens of this and *scutellatus* at our facility for some years and the unique ability to observe all aspects of living venomoid specimens of both snakes at close quarters to an unprecedented degree.

While relying on the diagnosis of Covacevich et. al. for the genus *Oxyuranus* to remain, I hereby add the following differences as itemized below to redefine the genus *Parademansia* Kinghorn 1955.

The list of differences given is also far from exhaustive.

The type species *microlepidota* which also happens to be the only one in the genus, differs from all other known *Oxyuranus* in several important regards. This includes, dentition, with the fangs being considerably smaller in this taxon, as compared with all *scutellatus*.

For the first time ever, I report that the smaller fangs reflect in the feeding behaviour of the snakes, in that *microlepidota* tend to chew on prey when biting including using post fang maxillary teeth and often leaving bite marks showing several breaks in the skin from the teeth, with the number of maxillary teeth being generally absent in the same number in *scutellatus*, whereas *scutellatus* will bite once and hang onto the prey and drag it under some sort of cover, where it waits for its venom to take effect. Venomoids do not know they have been "devenomized" and act the same way as "normal" snakes.

The "snap release" bite as documented for both taxa by other authors, is in my view a defensive bite, seen in most elapids, including Death Adders (*Acanthophis*), which otherwise also hold on to prey when first biting it.

The snap release grip is not usually the bite employed for feeding, unless perhaps the prey item painfully bites the snake, causing it to release its grip, or alternatively the prey taste is contrary to what the snake fancied or anticipated.

While both taxa will reverse crawl to a greater degree than other similar sized elapids, this trait is far more pronounced in *scutellatus*. The elongation of the neck is more apparent in *scutellatus* than in *microlepidota* while the degree of seasonal colour change in *microlepidota* is considerably more pronounced.

More importantly, the reduced number of scale rows in *microlepidota* (21), versus 23-25 in *scutellatus* is important as this is a generally conservative character in elapid snakes.

Hence the situation as of 2002 would have then become one

of each genus being effectively monotypic with the taxon *Oxyuranus scutellatus* having named subspecies.

In 2007, Doughty, Maryan, Donellan, and Hutchinson formally named a new taxon, "*Oxyuranus temporalis*" based on a Taipan found in the remote central ranges of Western Australia.

While that paper paints this taxon as a new "third species", the diagnosis in terms of physical characters is weak at best and in parts erroneous, in that character states that supposedly separate this taxon from the other two *Oxyuranus* (as defined by Covacevich et. al. 1981 and adopted by them) are in fact often shared with the other taxa.

See for example their references to ventral colouration of their new "species".

For reasons unknown, it appears that in their rush to publish the description, the authors failed to look at many specimens of the relevant taxa to see if their diagnosis actually worked!

Based on the photos of the holotype, the only known specimen of this "species" (*temporalis*) and the physical characters identified (scale counts, dentition and the like), it is clear that in many respects this new taxon is much closer to *scutellatus* than *microlepidota*. Furthermore, in spite of its obvious arid zone distribution, this taxon doesn't appear to fit midway between the other two taxa.

Hence there is nothing in terms of the new taxon *temporalis* that negates the merit of my (tentative) placement of *microlepidota* into the genus *Parademansia*.

If one accepts the view of Doughty et. al., in terms of the new Taipan/*Oxyuranus* being a new species, namely *temporalis*, which I tentatively do, then the case for the monotypic genus *Parademansia* is in some ways strengthened, due to the obvious difference between that snake and all other known Taipans, with others having the obvious differences outlined already (as a group).

NEW GUINEA TAIPANS

Intensive investigations into these snakes commenced in the late 1990's as part of a wider investigation into several species and genera of snakes in northern Australia/New Guinea where taxa had been overlooked by other workers. O'Shea 1996, p. 163, bottom left, provided a picture of an "*Oxyuranus scutellatus canni*" that looked quite radically different to the other three specimens on the page from Central Province (near Port Moresby), which would have been typical of the type race for the species.

Mark O'Shea's apparent lack of skill in identifying snakes is well-known and/or differences between known taxa, and seen repeatedly in his book.

Examples include the depiction of two species of python in the same 1996 book under the name *Leiopython albertisi*, with him taking seven years to recognize the reality of the species *Leiopython hoserae* Hoser 2000, after the Hoser 2000 paper was published.

That didn't however stop him publishing stinging criticisms of the 2000 paper, including for example, as (alleged) coauthor in Wüster's 2001 piece that was shopped to various journals before ending up in *Litteratura Serpentiaria* (see Wüster et. al. 2001). At the time these usual critics of all things "Hoser" were still denying the obvious as in, the existence of *Leiopython hoserae*.

In fact on countless internet posts, O'Shea, Wüster and Williams declared the taxon and the name "nomen nudem" and continued to masquerade the view that this taxon was simply a variant of the better-known *Leiopython albertisi*.

In his book on pythons published in 2007, O'Shea again refused to accept the reality of *Leiopython hoseerae*, even though by that stage, it was clear that python researchers worldwide had effectively unanimously adopted the reality of the "Hoser name", as easily verified by a "google" search for the same name.

It wasn't until end 2007 that in *Herptile* (a journal over which he apparently exercises despotic editorial control and censorship, although not nominally in the role of editor) and again in 2008, that O'Shea finally and grudgingly accepted the reality of the taxon, *Leiopython hoseerae* Hoser 2000! See O'Shea 2007a, 2007b, and 2008.

His 1996 book depicted the species *Pailsus rossignolii* Hoser 2000, at the time an undescribed taxon, which he erroneously labeled "*Pseudechis australis*", which happens to be a substantially different species that is restricted to continental Australia and immediately offshore islands.

In terms of Death Adders (Genus *Acanthophis*), O'Shea's identification skills are apparently woeful, which is amazing considering they are a common snake in New Guinea and he has put himself up as an expert on New Guinea reptiles in numerous places including his book, on TV "documentaries" and various print publications.

All Death Adders in his book are labeled "*Acanthophis* sp.", including such forms as *A. laevis* described in 1877, and *A. rugosa* described in 1948, both forms of which were formally described many years before I was even born and well before the 1980's when Wells and Wellington 1983 and 1985 delved into the taxonomy of the genus.

And while O'Shea can bitch and moan about Raymond Hoser's taxonomy, the fact is that both *laevis* and *rugosa* are valid species and were properly described by Macleay in 1877 and Loveridge in 1948, so you'd expect O'Shea to have finally got them right half a century later!

Even long after the publication of Hoser 1998 finally settled the taxonomy and nomenclature of the Death Adders of island New Guinea, O'Shea's publications have continued giving no reasonable guidance as to what *Acanthophis* in New Guinea is which, even though Hoser has published accurate keys to the species in New Guinea!

Hence, and notwithstanding the often-stated belief by O'Shea and colleagues, including Wüster and Williams that all New Guinea Taipans should be assigned to the subspecies *canni*, I continued investigating specimens from the west (principally Merauke), and finally formed the view that they are sufficiently differentiated from *canni* to be identified and named a new subspecies.

OXYURANUS SCUTELLATUS ADELYNHOSERAE SUBSP. NOV.

Holotype

A specimen in the British Museum of Natural History from Senggo, Irian Jaya, Lat 5.98 Long 139.36, BMNH 1992.542.

Paratype

A specimen from OBO, PNG, Western Province, Lat. 7.35, Long 141.20, in the California Academy of Sciences, CAS 133796, collected by Fred Parker.

Diagnosis

Oxyuranus scutellatus adelynhoserae subsp. nov. is readily separated from *O. s. canni* by colouration. Dorsally *Oxyuranus scutellatus adelynhoserae* subsp. nov. is olive or dark brown, whereas *O. s. canni* is grey to black or light blueish grey with a wide orange dorsal stripe with indistinct edges commencing from about the mid-body and running to

about the vent region.

This dorsal stripe is sometimes less distinct or even absent in some *O. s. canni*, and while seen sometimes in *Oxyuranus scutellatus adelynhoserae* subsp. nov., this is not commonly the case.

Oxyuranus scutellatus adelynhoserae subsp. nov. is separated from Australian *O. scutellatus scutellatus* and the north-west Australian subspecies on the basis of colouration. Australian *O. scutellatus* of both subspecies have a distinctive reddish brown tinge not seen in the New Guinea snakes.

If and when this tinge is absent, the specimens are either aberrantly coloured or within three weeks of a slough.

An olive tinge in the colour is definitive of the subspecies *O. scutellatus adelynhoserae* as no other Australian or New Guinea *O. scutellatus* have this.

This is a diagnostic character for the taxon and is reported here in accordance with article 13(1) of the ICZN code 2000.

Oxyuranus scutellatus canni is herein restricted to the region surrounding Port Moresby, Central Province, PNG and nearby areas. Taipans found from the Fly River drainage (Western Province), and westwards are of the subspecies *Oxyuranus scutellatus adelynhoserae* subsp. nov..

In the lowlands rainforest region bounded by the Purari River (Gulf province) and Bamu river, there are no reliable records for any *Oxyuranus* and this region is thought to be the natural barrier separating *Oxyuranus scutellatus canni* to the east and *Oxyuranus scutellatus adelynhoserae* subsp. nov. to the west.

Populations of the two New Guinea subspecies are believed to be geographically separated with no known gene flow between them. The period of this separation are not known. Studies have been published in relation to venom properties, DNA and other aspects of Taipans in Australia, New Guinea and both.

However the sample sizes of specimens used have tended to be small and the methods used also inconsistent, the result being it is hard to get any further insight into the relationships of the various subspecies based on published papers to date.

Added to this problem has been the fact that until now, all New Guinea Taipans have been erroneously referred to the subspecies *canni*, when those from places in Irian Jaya in particular should be referred to a different subspecies, now named as *Oxyuranus scutellatus adelynhoserae* subsp. nov. Specimens of *O. scutellatus adelynhoserae* are believed to be more closely related to Australian *O. scutellatus* than *O. s. canni* based on their underlying similarity in colouration and other factors.

Venom toxicity of all *Oxyuranus scutellatus* is believed to be high, with numerous studies published to date. So far there are no conclusive studies comparing the venoms of regional populations, including those of the two different New Guinea subspecies, or for that matter decent comparisons between the Australian taxa and the New Guinea ones that involve large sample sizes and consistent sampling methods.

Most reports on the behavior of all subspecies of *O. scutellatus* tend to be sensationalist and exaggerate the alleged speed of movement and aggressiveness of these snakes.

In all manner of behavior, they fit within the normal range for other similar-sized elapids and by no stretch of the imagination can a Taipan be defined as aggressive.

In five years of free-handling captive Coastal Taipans (*O. s. scutellatus*) on a daily basis, I have never been bitten. Those snakes have been venomoid.

By contrast, three bites from (venomoid)(devenomized) inland Taipans (*Parademansia microlepidota*) during the same period arose in every instance when the snake was agitated by another snake and the biting snake simply struck at the nearest object that happened to be my arm.

Etymology

Named in honour of my daughter, Adelyn (pronounced "Adder-lyn", like the Death Adder snake) Hoser, aged 9 in 2008, who has already made a great contribution to wildlife conservation through her work in educational reptile shows by our company Snakebusters. In several years of handling the world's five deadliest genera of snakes, she has never had a bite from any, indicating a general lack of skill by so-called "snake handlers" many years her senior, who have made countless trips to hospitals to deal with snakebites.

In July 2012 she voluntarily took bites from a venomoid Taipan and Death Adder in front of an audience (which we filmed) to prove that business rivals were lying by claiming these venomoid snakes had regenerated venom.

In spite of these images being shown globally, (with Adelyn suffering no effects from the devenomized snakes), as recently as February 2012, a corrupt Judge at a Victorian tribunal, named Pamela Jenkins issued a scathing judgement stating as "fact" that all the venomoids had regenerated venom and were a major public risk and then closed Snakebusters down allowing rivals with dangerous non-devenomized snakes to steal all our clients and put the public at real risk..

Just days later a government-backed snake handler from a rival company was carted to hospital for a venomous snake bite. No action was taken against him!

THE NORTH-WEST AUSTRALIAN TAIPANS

This taxon was formally named in Hoser (2002) as "*O. scutellatus barringeri*".

The key definitive diagnostic characters identified were distribution and DNA, the differences in terms of the latter not actually specified.

In a 2004 paper (Wüster et. al. 2004), wrote and without substantiation, the following comment, which as intended has been widely quoted and circulated, including on friendly internet sites:

"The name *O. s. barringeri*, proposed for the populations from the Kimberley area of Western Australia by Hoser (2002), is a *nomen nudum*, as the description does not provide a diagnosis compliant with Article 13.1 of the International Code of Zoological Nomenclature."

They provided no elaboration or further information.

The claim of "Nomen Nudum" has consistently been used by convicted wildlife smuggler David Williams (co-author in the above referred paper) and partner Wolfgang Wüster for all Hoser named taxa and should be treated with the disdain the comment deserves.

For the record, the relevant article of the code (Ride et. al. 2000), states that to be available, every name must:

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

While the original paper speaks for itself and my views are

different to those of the authors (Wüster et. al.), there is little if any prospect of them conceding ground or desisting from their intended deliberate confusion on the matter.

The long-term intent of this deliberate confusion is to cause non-use of the original name "*barringeri*" and perhaps ultimately a hearing and opinion at the ICZN, which at best may take years, or worst case, even decades to resolve.

As the ICZN tends to rule on the grounds of stability (their stated guiding principle), rather than their own rules and articles as published in the code, the outcome of a long-running battle either involving or not involving the ICZN is not certain, especially as the stated aim of Wüster, Williams and others is to deliberately create instability and confusion.

To resolve the situation and stabilize the nomenclature of the taxon in accordance with the code as most recently published, I hereby publish a totally new description of the relevant taxon, without reference to the 2002 description in any way, with sufficient information to conform with even the most rigid or convoluted interpretation of Article 13(1) of the rules and other ICZN rules as relevant. This description also amends and updates known information on the taxon, but again is written without any direct reference to or connection with the 2002 paper.

NORTH-WEST TAIPAN *OXYURANUS SCUTELLATUS ANDREWILSONI* SUBSP. NOV.

Holotype: A poorly preserved sample of a sub-adult specimen collected by W. H. Butler on 6 November 1978 lodged at the West Australian Museum (registered number R60666). The snake was collected 6 km North-west of Amax Camp on the Mitchell Plateau, (approx. Lat 14°47' Long 125°55') in the northwest Kimberley region of WA (Butler, 1979). The specimen was about 136 cm long including its tail of 22 cm.

Dorsally the scales are long, narrow and smooth with very weak keels around the neck. There are 23 mid-body rows, 241 ventrals, single anal and 69 paired subcaudals. The prefrontals are large (nearly as long as the supraoculars and much wider). The frontal is straight-sided and about two and a half times as long as it is wide and slightly narrower than the supraocular. The nasal is entire. The preocular is higher than wide and separated from the nasal and frontal. There are 2+2 temporals on one side and 2+3 on the other side. The lower primary is largest and descends deeply between the last two labials. There are six upper labials and seven lower labials.

Diagnosis

Unlike all other *Oxyuranus scutellatus* (either from eastern Australia or Island New Guinea), this taxon does not have a distinct lightening from the snout.

In common with other *O. scutellatus*, the eye is reddish.

Also the shape of the head is distinctly rounded as compared to all other *Oxyuranus scutellatus* (either from eastern Australia or Island New Guinea), which are herein broadly defined as having coffin-shaped heads.

Combined, these are without doubt the most simple means to separate this taxon from all other *Oxyuranus scutellatus* subspecies.

This is the subspecies of Taipan that occurs in North-west Australia including the top end of the Northern Territory. It is the only known form of Taipan from this area. *Oxyuranus scutellatus andrewilsoni* subsp. nov. is separated from other Taipans *Oxyuranus scutellatus scutellatus* and *Oxyuranus scutellatus canni* by any, any combination of or all

the following characteristics and/or characteristics not listed herein.

Scalation on the neck is more rugose in *O. scutellatus andrewwilsoni* subsp. nov. as opposed to usually either weak or nearly absent in all other *Oxyuranus* (either from eastern Australia or Island New Guinea).

O. scutellatus andrewwilsoni is also separated from all other *Oxyuranus scutellatus* by distribution.

Oxyuranus scutellatus scutellatus is only definitively known from the coastal strip of Queensland and nearby areas.

Other *Oxyuranus scutellatus* subspecies are restricted to island New Guinea. No *Oxyuranus scutellatus* are known from the Gulf of Carpentaria (except the east side) and hence the taxon *Oxyuranus scutellatus andrewwilsoni* is geographically isolated from all other *Oxyuranus scutellatus*.

Oxyuranus scutellatus from islands off the NT and WA coast are also referable to the subspecies *andrewwilsoni*.

All subspecies of *Oxyuranus scutellatus* are further separated by DNA analysis.

In 2002, this author knew of only two specimens of *Oxyuranus scutellatus andrewwilsoni*. These were the type specimen and a second specimen from Koolan Island, WA (Storr, Smith and Johnstone 1986). Koolan Island (Lat 16°08' Long 123°45') is about 130 km in a straight line, north-north-west of Derby. The Island has an airstrip so in theory it shouldn't be too hard to mount an expedition to the area to search for further specimens.

Further specimens have emerged and been inspected, including from the Northern Territory.

Taipans (*Oxyuranus scutellatus andrewwilsoni*) are separated from other similar venomous snakes known or thought to occur in north-west Australia by a number of characters including the following:

Oxyuranus has two primary temporals vs only one in *Pseudonaja*. (refer to Storr, Smith and Johnstone 1986)

Oxyuranus has 21-23 mid-body rows vs 17 in *Cannia* and *Pailsus* (refer to Hoser 1998).

In relatively recent geological times, the distribution of all *Oxyuranus* may have declined due to competing species, in particular *Cannia australis* and variants thereof (refer to the arguments presented in Hoser 2001 with reference to similar species as (potentially) being equally applicable to snakes of the genus *Oxyuranus*, thereby explaining the present day disjunct distribution).

Those arguments were plagiarized and bootlegged by Wüster et. al. 2004 without correct citation or attribution of the original source.

ETYMOLOGY

The name is in honour of Andrew McMaster Wilson (usually calling himself Andrew Wilson). He has decades long experience with reptiles and has an enviable record in terms of his educating the public about reptiles with Australia's leading reptile demonstrator's "Snakebusters".

At the time of writing this paper, Andrew was very ill with a form of cancer.

WHY ARE TAIPANS (OXYURANUS) SO DEADLY?

For the first time ever this question is answered, at least in part.

This question is perhaps better asked as to why have they evolved particularly deadly venom.

Observations of feeding in these snakes in captivity yields an

important difference in terms of their swallowing ability as compared to other elapids of similar size.

Put simply, they are capable of distending their head and neck to allow much larger items to be swallowed, putting them in the ballpark of some pythons in terms of swallowing ability.

This swallowing ability is tested regularly as captives readily take larger food items than other elapids of similar size.

In the wild state, elapids must kill food "instantly" and preferably before the prey item either bites back, or flees too far away. This is why venom must be so deadly in all large elapid snakes.

The venom that kills a mouse instantly (within seconds), kills larger mammals like humans in minutes or hours.

With the average adult Taipan (about 1.5-2 meters long) eating rats, which are about 10 times the mass of mice, the diet of other similar sized elapids, it stands to reason that the Taipans need to have venom ten times deadlier in order to kill prey in a similar time frame.

The deadliness is defined here as the multiple between toxicity and actual amount yielded in a bite.

TAIPANS IN CAPTIVITY

While Taipans occupy a unique place in the human mindset, due to their extreme venom toxicity, the reality of Taipans in terms of how they see the world and their captive husbandry is notably unspectacular.

As it happens, the successful captive husbandry for Taipans is effectively no different to that for other large elapids.

There are no idiosyncrasies or features that make these snakes particularly hard to keep, other than perhaps the common range of ailments seen in all other large elapids from time to time, be they infectious diseases, parasites or age-related complications.

In terms of feeding, this is rarely a problem in that even newly hatched snakes generally feed voluntarily in captivity, which contrasts with some other Australian elapids when first offered rodent prey as young snakes.

In reality, the extreme venom toxicity of this snake has been a negative factor for these snakes in captivity as seen in the example given shortly.

A factor commonly seen in reptile collections with dangerous elapids, especially Taipans has been a general reluctance of keepers to handle the relevant snakes due to the very real worry of dangerous bite.

This is seen in cages not being cleaned as often as necessary, fecal accumulation and the like.

At it's worst, this reluctance to engage in "hands on" with these snakes leads to diseases being undiagnosed until too late in terms of survival of the snake, or as shown below, simple fear to treat treatable ailments than untreated may become fatal.

In contrast to this picture, I have for many years advocated that keepers must countenance the risks of bites if and when keeping elapids, with myself always regarding the snake's welfare as the paramount consideration.

Secondarily, a reasonable amount of common sense can avoid serious bites, without the need to engage in undue brutality to the snakes in terms of day to day handling.

A classic example of this "neglect through fear" of Taipans can be seen on a Youtube video of a newly acquired New Guinea Taipan, held by North American Al Coritz (calling himself "Viperkeeper") as seen online in early 2008 (posted

in 2007).

In his home-made video clip posted at: <http://www.youtube.com/watch?v=ujBiDuloYgM> spanning nearly 14 minutes, he repeatedly gloats over the fact that he is keeping a mega deadly snake and how as a result, he is afraid to handle it.

Coritz even points out a parasitic tick on the snake (also seen with long-overdue and unshed skin at 31 seconds into the video) and mentions that due to his fear of the snake he will not remove it.

Of course, ticks (such is the large one depicted on the snake's neck) carry other parasites (e.g. flukes) and diseases and through simple blood borne infectious agents may quite quickly kill a snake (wild or captive).

Put simply, on that basis alone, Coritz should not be allowed to keep Taipans.

(Tubing the snake and injecting with ivermectin, all safe and easy, would have killed the tick/s).

But to make things far worse, the same video shows his caging and it shows pretty much everything in terms of how not to keep Taipans. There is effectively no ventilation in the cage. Added to this is a thin clear plastic water bowl (that looks like a "punch" bowl seen at an adult's party) that the snake is seen moving about with ease, the result (also shown) is spilt water in the cage (not cleaned up of course), intolerably high humidity, which when combined with the squalid substrate (some now in the water bowl and other littered with visible uncleaned fecal waste material from the snake) forms a culpably filthy bacterial cocktail that will almost certainly guarantee a very rapid demise of the poor hapless Taipan.

Coritz's reluctance to properly clean his Taipan's cage is repeatedly explained by his comments about the speed and deadliness of the snake and when combined with another (2008) video of himself promoting convicted wildlife smuggler David John Williams (see above) at: <http://www.youtube.com/watch?v=QzgluS-tIKc>, is entirely understandable.

In true American style, Coritz is seen to be morbidly obese and hence it comes as no surprise that he is understandably afraid of his inability to avoid a bite from the Taipan if the tick infested snake chooses to strike.

This real fear is enhanced by the fact that the Taipan and other snakes at his facility are apparently brutalized by the use of bone-breaking tongs and other implements as depicted in his above-mentioned video clip and others he's depicted on "youtube".

The Coritz clips also demonstrate a growing problem of misinformation on reptiles in terms of what is seen on the internet.

Too many novices view what's on the web as "fact" and/or acceptable practices (which they are not), the result being that often misinformation bounces around so much until it becomes widely believed as true.

The end-point of course is a higher mortality in terms of snakes, including dead snakes with bones broken through use of metal tongs.

The correct way to keep Taipans in captivity, free of squalid cages, tong trauma and the like can be found in various publications, most notably, Barnett (1999) and Hoser (2008b), both papers of which include information and data on both keeping and breeding of Taipans.

While at the time of writing this paper in mid 2008, all our

Taipans have been venomoid for some years, so we have an obvious advantage in that there is zero risk in terms of cleaning cages, inspections and the like, this has not always been the case, with all relevant snakes having been either acquired as venomous and/or hatched here from our own incubated eggs as fully venomous young.

(For the record, for more than three decades, no Hoser elapids were venomoid and in that time snake's welfare was never compromised and also no life threatening bites incurred).

In the case of one of the Inland Taipans, I had to force-feed the (originally hatchling) snake for about a year (fully venomous) before it commenced feeding voluntarily, after which it was venomoided and has remained so for some years since.

Finally there has been considerable deliberate misinformation to the effect that venomoid snakes regenerate venom, most notably on Shane Hunter's site (www.aussiereptilekeeper.com) on which convicted smuggler David Williams has made himself "moderator" or controller.

The fact is that, in none of our forty odd such (venomoid) snakes has this occurred. This has been confirmed by several means, including inspections by myself and several qualified vet surgeons, post mortems of dead venomoids (2 such cases), including photographic proof, attempted extractions of venom by all available means, milking, biting animals (or myself) and so on.

In terms of myself, all venomoids, including the Taipans have been made to bite me in front of large audiences of witnesses, and we have made several videos of this.

Interestingly the venomoids are reluctant to bite due to the fact that the snakes are used to being painlessly handled and have no need or desire to bite, so the snakes are forced to bite for the videos being made.

If the long-term venomoid Taipans had in fact regenerated venom, then there is no way, I'd be able to line three of them up (Inland and Coastal) to make them bite me in the arm in succession, with each bite being forced and of long pumping duration, and for me to survive without any treatment of any kind!

Likewise for the various "Snakebusters" staff who have also had venomoid bites just to prove the point that the snakes have no venom.

In places without Taipan anti-venom the use of venomoids makes eminent sense, both for the snake's welfare (see above) and that of the keeper/s.

This is especially the case if and when a fatal bite may occur, the end result being that government/s may use the event as an excuse to outlaw or further restrict the rights of non-government employed reptile keepers.

PANACEDECHIS PAPUANUS (PETERS AND DORIA 1898)

The genus name "*Panacedechis*" is adopted for these snakes based on the results of Shea, Shine and Covacevich (1993), in tandem with the papers of Wells and Wellington 1983 and 1985, which make this name the appropriate available name for this taxon at genus level.

This is the same as seen in Hoser 2001.

Most texts call this taxon, "*Pseudechis papuanus*" as originally named, the common name being the "Papuan Black Snake".

It is an archaic lineage with apparently greater affinities to the Collett's and Blue-bellied Black Snakes than the Red-bellied Black or Mulga/King Brown Snakes. The latter two taxa

never crossed Torres Strait indicating a recent evolutionary history, especially when reconciled with the generally continuous distributions of the species across their entire known ranges in Australia.

For many years it has been known that there are two apparently disjunct populations of the taxon *P. papuanus* in island New Guinea. The eastern population, centered on central province of PNG, through to Milne Bay has apparently dropped significantly in abundance following the introduction of Cane Toads (*Rhinella marina*) (known widely as “*Bufo marinus*”).

While apparently absent from the Kikori basin, the species is found in a separate western population, that is found throughout most of Western Province and nearby parts of Irian Jaya.

Consistent differences between adult specimens from both populations warrants each being classed as distinct from one another, especially as there is no known gene flow between the populations. Hence the western population is formally described and named below.

The diagnosis for *Panacedechis papuanus* is given in the original description of the taxon, and expanded on in later texts including those cited at the foot of this paper.

These are relied upon here.

PANACEDECHIS PAPUANUS TREVORHAWKESWOODI SUBSP. NOV.

Holotype

A specimen from the California Academy of Science, specimen number: CAS 139559, from Boboa Island, Lake Murray, Western District, New Guinea, Lat. 7.05, Long 141.35.

Diagnosis

Panacedechis papuanus is a thick-set snake, superficially similar in most respects to the Mulga Snake, *Cannia australis*, but is separated easily by its darker ground colour and different distribution and mutually exclusive distribution. One is found in continental Australia (and adjacent islands), while the other is restricted to Island New Guinea (and adjacent islands), that being *P. papuanus*.

Panacedechis papuanus is separated from Taipans, genus *Oxyuranus* and Brown Snakes (genus *Pseudonaja*) by their more thick-set build and some single (anterior) subcaudals, versus all divided in the other genera.

Pailsus is separated from *Cannia* in New Guinea by their having all or most subcaudals single, versus many posterior subcaudals divided in *P. papuanus*.

There are no other snakes likely to be confused with adults of this taxon.

Panacedechis papuanus generally has 48-65 subcaudals with the anterior ones single and the rear ones divided, which is a character state not shared with any other large elapids in New Guinea that are likely to cause confusion in terms of identification.

Panacedechis papuanus trevorhawkeswoodi subsp. nov. is separated from *Panacedechis papuanus papuanus* by several characters, the most obvious being that adults tend to be nearly pitch black dorsally, whereas specimens of *P. papuanus papuanus* from further east tend to be somewhat lighter in colour, although still a darkish colour.

In *Panacedechis papuanus trevorhawkeswoodi* subsp. nov. there is a slight dark etching around the dorsal and ventral labial scales to a more pronounced degree than is seen in *P.*

papuanus papuanus.

Lightening of the snout region to become creamish white is less pronounced in *Panacedechis papuanus trevorhawkeswoodi* subsp. nov. than for *P. papuanus papuanus*, again a useful means of separating the taxa.

The two taxa are of course separated by distribution as noted above, namely that *Panacedechis papuanus trevorhawkeswoodi* subsp. nov. is found west of the Kikori Basin, while *P. papuanus papuanus* is found east of the Kikori Basin.

Included in the distribution of *Panacedechis papuanus trevorhawkeswoodi* subsp. nov. is Sabai Island in Torres Strait, which while being physically near the New Guinea mainland is in fact in Australian government territory.

The two subspecies of *Cannia papuanus* would of course have genetic differences, but these have yet to be determined in detail.

While *Panacedechis papuanus trevorhawkeswoodi* subsp. nov. is known to be oviparous, little is known about its biology, save for the fact that in most regards it is believed to be a “typical large elapid”.

Behaviourally in terms of how these snakes act when caught, handled and held in captivity, *Panacedechis papuanus trevorhawkeswoodi* subsp. nov. is in line with others in the genera *Cannia*, *Panacedechis* and *Pseudechis*.

Conservation

Panacedechis papuanus trevorhawkeswoodi subsp. nov. is common where it occurs and introduced Toads (*Rhinella marina*, formerly known as *Bufo marinus*) remain absent.

However it is reasonable to expect that eventually the entire range of *Panacedechis papuanus trevorhawkeswoodi* subsp. nov. will be invaded by the introduced Toads and the snake will decline in number, perhaps to the point of local or general extinction, as has been seen for *Panacedechis papuanus papuanus* in the most inhabited parts of New Guinea.

Therefore it is appropriate for specimens of *Panacedechis papuanus* of both subspecies to be retained in captivity and bred in sufficient numbers as insurance in the event of extinctions in the wild.

Due to a general lack of resources in New Guinea, the bulk of the captive husbandry should be outside of that country, perhaps in the USA, Europe or Australia.

A general impediment to keeping “exotic” and dangerously venomous taxon has traditionally been the unavailability of appropriate anti-venom, either in real terms or effectively, due to the high purchase cost and short shelf life.

With the development of new means to safely and easily de-venomize these snakes (see Hoser 2004 for the basic method and Hoser 2008 for the long-term results and benefits), the safe keeping and breeding of numbers of these snakes without safety risks or the need for the holding of anti-venom stocks is now possible.

Of all snake species in New Guinea, it is fair to assume that *Panacedechis papuanus* or perhaps *Pailsus rosignollii*, are most at risk, as seen by the sharp declines in congeners in parts of Australia where toads have been introduced.

The only potential upside to report in terms of regions invaded by Toads is that some years later (ranging from several years to several decades) a “bounce back” is observed, where numbers of reduced species increase as the survivors adapt to cope with the toads.

The best seen example to date has been a general increase

in Red-bellied Black Snakes (*Pseudechis porphyriacus*) in Queensland in Cane Toad (*Rhinella marina*) infested regions of the coast.

Etymology

Named after Dr Trevor J. Hawkeswood, a respected biologist and author of scientific papers, books and other publications on Australian, New Guinean and other animals and plants, having spent decades researching and publishing his findings, including in the journal *Calodema*.

In spite of repeated unlawful threats from David Williams and his criminal associate Shane Hunter in recent years, Hawkeswood has continued his vitally important work.

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A NEW GENUS OF ASIAN PITVIPER (SERPENTES: VIPERIDAE).

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ABSTRACT

This paper formally recognises the Taiwan Mountain Pitviper *Trimeresurus gracilis* Oshima, 1920 as being sufficiently distinct from similar pitvipers of the genus *Trimeresurus* Lacépède, 1804 (type species *T. viridis*) to be placed in a different genus.

While several other genera have been created to accommodate species previously placed within or likely to be placed within *Trimeresurus sensu lato*, the taxon *Trimeresurus gracilis* Oshima, 1920 does not fit within any.

Therefore this paper formally names and diagnoses a new genus *Oxyus* gen. nov. to accommodate this taxon.

At the present time this is a monotypic genus.

Keywords: new genus; *Trimeresurus*; *gracilis*; *Oxyus*; Viperidae; Crotalinae; Hoser; snake; genus.

INTRODUCTION

The pitviper genus *Trimeresurus* Lacépède 1804 *sensu lato* has been subject of intense research in recent years, with numerous new taxa being formally described and proposals made to split the genus as recognised to smaller divisions.

Notable published studies of the systematics of these snakes include those of Das and Yaakob (2007), David, et. al. (2011), Gumprecht, et. al. (2004), Guo, et. al. (2007), Guo, et. al. (2009), Guo and Wang, (2011), Malhotra and Thorpe (2004), Malhorta, et. al. (2011), McDiarmid, et. al., (1999), Tu, et al. (2000) and Zhao and Adler (1993).

Recent divisions within *Trimeresurus sensu lato* or re-interpretations of it, has resulted in the transfer of species to the following genera: *Garthius* Das and Yaakob 2007, *Ovophis* Burger 1981, *Protobothrops* Hoge and Romano-Hoge 1983, *Sinovipera* Guo and Wang 2011, *Tropidolaemus* Wagler 1830, *Triceratolepidophis* Ziegler, et. al. 2000, *Parias* Gray 1849, *Cryteletrops* Cope 1860, *Peltopelorus* Günther 1864, *Himalayophis* Malhotra and Thorpe 2004, *Popeia* Malhotra and Thorpe 2004, *Viridovipera* Malhotra and Thorpe 2004, *Cryptelytropis* Cope 1860, as well as the

retention of a generally monophyletic group within the original *Trimeresurus* Lacépède 1804.

Various other generic names have been proposed for different species within the above group, but have not necessarily come into use for a variety of reasons.

This use or non-use of given generic names is not relevant to the taxon subject of this paper in as much as it fits within none.

Some of the above cited generic names may even be questionable under the current and most recently past zoological codes as published by the ICZN.

By way of example, the series of names proposed by Malhorta and Thorpe 2004 (namely *Himalayophis* Malhorta and Thorpe 2004, *Popeia* Malhorta and Thorpe 2004 and *Viridovipera* Malhorta and Thorpe 2004) were not defined in accordance with the code (several articles) and therefore unless properly defined since, remain unavailable for the purposes of zoological nomenclature.

While it would be prudent for me to properly describe the relevant genus level taxa so that names are in fact

“available”, as a matter of correct ethics, I have instead refrained from doing so and herein provided Anita Malhorta the opportunity now to correct the anomaly and retain “naming rights” over the subject genera and to stabilize the nomenclature.

Ceratrimeresurus Liang and Liu (2003) was synonymised with *Protobothrops* in 2008 (David et. al. 2008). *Ermia* Zhang 1993 is not an available name for snake taxa (already a genus name for something else) and *Zhaoermia* Gumprecht and Tillack 2004 was later found to be synonymous with *Protobothrops* (Guo et. al. 2007).

Several studies have highlighted the significant differences between *Trimeresurus gracilis* Oshima 1920 and other apparently similar vipers in the genera listed above.

These include the results of Malhorta and Thorpe 2004 and more recently Pyron et. al. 2011 both of whom have shown differences between the taxon *gracilis* and others within the genus *Trimeresurus sensu lato*.

Relying on this material and the obvious physical differences between these snakes and others placed within *Trimeresurus sensu lato* and the absence of an appropriate genus to place this taxon within, a new genus is formally described below.

GENUS OXYUS GEN. NOV.

Type species: *Trimeresurus gracilis* Oshima 1920

Diagnosis: Separated from all other similar pitvipers by the following suite of characters: A small snake; with total adult length not exceeding 60 cm; there are 15-27 (19-21 at mid-body) rows of scales, which are keeled and rough, except for the first or second scale rows, anal scale is entire, and subcaudals are paired; head is broad, more-or-less triangular, covered with small scales, and distinct from neck; body is stout or robust; tail is small; there is a prominent angular ridge from upper eye to end of nose, and a prominent pit between eye and nostril; eye is medium-sized, high on the head and forms slight bulge on the upper head; the iris is light brown to tan dappled with dark pigment which blends with color of head, and there may be a horizontal brown to brown-black band of diffuse pigment across middle of eye, which is in line with dark brown band posterior to eye; the pupil is vertically elliptical, black, with narrow, indistinct margin of white; tongue is dark gray to black, with stem lighter than fork tips; fangs are large, movable, in sheath in anterior part of upper jaw; dorsal head is brown to dark brown, with designs of darker brown of varying intensities; there is a dark band extending from eye to corner of mouth which is bordered by stripes of whitish or light brown; sides of head are dirty white to tan, or white and mosaicked with black; upper body is light brown to red brown with many designs or shades of chocolate to brown black; there is a mid-dorsal series of dark designs, and a lateral one on each side which tends to be in line with the mid-dorsal one; the dark designs may or may not have narrow whitish margins; some individuals may have small white dots on the tail; ventral head is off-white to tan and may be shaded by varying quantities of scattered black pigment; ventrals are off-white to light brown, becoming darker towards the rear of the body; it is conspicuously mottled with diffuse black to red brown spots, which may be square and arranged roughly as a checkerboard or form moderately broad irregular longitudinal lines along sides.

Endemic to the Island of Taiwan.

Common name is Taiwan Mountain Pitviper.

Viviparous and reported to produce litters of 2-8.

The genus is monotypic for the species *gracilis*.

Etymology: Named in honour of our pet Great Dane, whom we always treat as an equal, named *Oxyuranus* (who we called “Oxy” for short), hence the genus name, who’s faithful services from 2004 to 2012 deserve an honour.

PS. *Oxyuranus* is the genus name for an Australasian elapid.

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A taxonomic revision of the *Vipera palaestinae* Werner, 1938 species group, with the creation of a new genus and a new subgenus.

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ABSTRACT

Vipera palaestinae Werner, 1938, a well-known species to biologists, has been neglected by taxonomists. This paper rectifies the anomaly and herein defines a new genus to accommodate the species, named as *Maxhoservipera* gen. nov.. Two allied species, currently placed in the genus *Macrovipera* are also moved into this new genus. Those taxa, known before now as *Macrovipera deserti* (Anderson, 1892) and *M. mauritanica* (Duméril and Bibron, 1848) are further placed within a newly diagnosed subgenus *Laidlawus* subgen. nov.. This enables the two subgroups within the main genus to be properly identified.

Keywords: Taxonomic revision; *Vipera*; *palaestinae*; Werner; genus; new; *Vipera*; *Macrovipera*; *Maxhoservipera*; *Laidlawus*; *deserti*; *mauritanica*; *Daboia*; *russelii*; Hoser; snake; subgenus.

INTRODUCTION

The viperidae have been the subject of taxonomic interest since zoologists commenced looking at such animals using current classification systems in the 1700's. For most of the 20th century, the majority of viper species were simply placed within the genus *Vipera*. Recognising the paraphyletic nature of the group, taxonomists have split off a number of genera to accommodate clearly distinct species-groups.

With the introduction of genus-wide screening via molecular and other methods, relationships between Viper species have become better known.

To that end, previously erected genera that accommodate species formerly placed within *Vipera* including *Macrovipera*, *Daboia* and *Montivipera* have become widely accepted by most herpetologists.

While the three genera *Vipera*, *Macrovipera*, *Daboia* all include type species and other component taxa clearly related to the species known as *Vipera palaestinae* Werner

1938, it is my considered view that none are sufficiently close, either morphologically, in habits or molecularly to warrant placement of this species within those genus groups.

To compound matters, neither *Vipera palaestinae* Werner 1938 or *Macrovipera mauritanica* and *M. deserti*, both the latter of which are clearly more closely related to this taxon, than any other, are particularly similar to or closely related to any of the other genera (see Pyron, et. al. 2011) other than by virtue of convergence.

It is conceded that on the evidence of Pyron et. al. (2011) and others such as Garrigues et. al. (2005) and Stümpel et. al. 2009, that the genus *Daboia* is that which is most closely related to the trio of species subject of this paper.

However the component species within the genus as widely recognised (type species *Daboia elegans* Gray, 1842 being synonymous with *russelii*) are still sufficiently different to those subject here to warrant the creation of a new genus.

D. russelii is noticeably thinner than the other taxa no doubt as a result of it's significantly different feeding ecology driving

it's evolution in a different direction. Colouration and other attributes set this taxon apart from the other morphologically conservative vipers in the *palaestinae* complex.

I also concur with Hermann et. al. (1992) who restricted *Daboia* to the species taxon *russellii*.

Note however that the very similar taxon *Daboia siamensis* was resurrected from synonymy with *russellii* by Thorpe et. al. in 2007.

It already increases the size of the genus *Daboia* to two similar species. With yet more already named and recognised subspecies being flagged as being likely "full" species by Thorpe et. al. 2007, the argument against splitting *Daboia* on the grounds of an unwanted creation of monotypy cannot be sustained.

Furthermore I note that the findings of Stümpel et. al. 2009 (p. 182, fig. 1) shows *Montivipera* and *Macrovipera* (*lebetina* only) both being more closely related to one another, yet placed in separate named genera, than the taxa *russellii* (alone) and (versus) *palaestinae* and *mauritanica* (as a more closely related pair) that he then placed in the pre-existing named genus *Daboia*.

This placement was inconsistent on the basis of the evidence presented.

Therefore to correct this anomaly, *Vipera palaestinae* Werner 1938 is placed in it's own new genus, namely *Maxhoservipera* gen. nov..

Two other taxa, namely those known currently as *Macrovipera mauritanica* and *M. deserti* are clearly not particularly close to the nominate type species for that genus, namely *M. lebetina*, (and cogener *M. schweizeri*) (refer again to Stümpel et. al. 2009 (p. 182, fig. 1)) and yet are clearly more closely affiliated with the taxon *Vipera palaestinae* Werner 1938 (refer to Pyron et. al. 2011) so are included in the new genus erected here.

Within this genus, currently consisting of three taxa, the two species formerly placed within *Macrovipera* form a distinct group and are therefore placed within a newly named subgenus (*Laidlawus* subgen. nov.) to properly account for this position.

The viperidae are of course a well-known genus of generally medium to large-sized stout-bodied venomous snakes from with a distribution centred on the continental masses of Eurasia and Africa.

On close inspection they are not likely to be confused with any other snakes on the basis of their large retractable fangs that become erect when the mouth opens, highly developed venom apparatus and their general size and shape.

GENUS MAXHOSERVIPERA GEN. NOV.

Type species: *Vipera palaestinae* Werner 1938

Diagnosis: Separated from all other vipers by the following suite of characters: generally large (average 70-90 cm total length as adults), never more than 150 cm total length as adults, of very thick-set viperine build (stout and heavy); and keeled dorsal scales, with the keels forming a series of ridges running longitudinally along the body; the lowest row of scales (before the ventrals) does not have keels, the tail is short; the head is large, thick and triangular in shape; vertically elliptical pupil in a distinct medium-sized eye, the body pattern usually being in a chain-like configuration, usually with darker diamonds along the spine and broken bands on the flanks, over a lighter ground-type colour; 10-12 supralabials with 3-4 rows of scales separating the supralabials from the eyes; 25-33 mid body rows, 140-180

ventrals, 40-50 all divided subcaudals, two pairs of chin shields, the front ones noticeably enlarged; separated from all other vipers except the Russell's viper (*Daboia*) by the presence of a dark blotch or stripe running vertically from the top of the mouth into the eye, although this may appear faded in large snakes; separated from the Russell's viper by the less thick-set build of the Russell's viper and the fact that the dark blotch running into the eye is considerably wider than the eye, as opposed to being roughly the same width. The Russell's viper is further separated by its dorsal pattern which is not in the zig-zag configuration seen in this genus. The pattern in *Daboia* is a color pattern consisting of a deep yellow, tan or brown ground color, with three series of dark brown spots that run the length of its body. Each of these spots has a black ring around it, the outer border of which is intensified with a rim of white or yellow, but giving an impression of ovals, smooth circles or similar as opposed to the more typical viperine zig-zag or chain pattern. The dorsal spots, which usually number 23-30, may grow together, while the side spots may break apart.

The taxon *palaestinae* (subgenus *Maxhoservipera* subgen. nov.) is separated from others in the genus by the configuration of the blotch running to the eye. In this taxon it is of continuous thickness from the labial to the eye, narrowing slightly from the rear as one moves towards the eye.

By contrast, in the other two taxa *deserti* and *mauritanica* (subgenus *Laidlawus* subgen. nov.) one has the blotch narrowing considerably as it meets the eye giving it a triangular appearance.

Vipers are distinct, usually thick-set snakes with a well developed venom apparatus and large retractable fangs that fold into the mouth when not in use. The thick-set build relates to the ambush predator feeding plan on the snakes.

They have large fangs used to hold prey when bitten and a heavy body with which to hold down struggling prey, usually by force of weight and holding with a stiff neck as the prey is bitten and subdued.

This genus is distributed disjunctly.

M. palaestinae is restricted to the general region of Palestine, including Israel, Lebanon, Jordan and Syria. *M. deserti* and *M. mauritanica* occur in north-west Africa.

Etymology: Named in honour of my Sydney-based cousin Max Hoser, who spent many days with me in my youth catching snakes and other critters in the 1960's and 1970's, as well as recognition of his vital public service work in the decades since.

Species in genus *Maxhoservipera* gen. nov.

M. palaestinae (Werner 1938)

M. deserti (Anderson 1892)

M. mauritanica (Duméril and Bibron 1848)

SUBGENUS LAIDLAWUS SUBGEN. NOV.

Type species: *Vipera deserti* Anderson 1892

Described as: *Vipera lebetina* var. *deserti* Anderson 1892:20.

Diagnosis: The taxon *palaestinae* (subgenus *Maxhoservipera* subgen. nov.) is separated from snakes in this subgenus by the configuration of the blotch running to the eye. In this taxon it is of continuous thickness from the labial to the eye, narrowing slightly from the rear as one moves towards the eye.

By contrast, in the other two taxa *deserti* and *mauritanica* (subgenus *Laidlawus* subgen. nov.) one has the blotch narrowing considerably as it meets the eye giving it a

triangular appearance.

The diagnosis separating all *Maxhoservipera* gen. nov. from all other vipers follows here:

Separated from all other vipers by the following suite of characters: generally large (average 70-90 cm total length as adults), never more than 150 cm total length as adults, of very thick-set viperine build (stout and heavy); and keeled dorsal scales, with the keels forming a series of ridges running longitudinally along the body; the lowest row of scales (before the ventrals) does not have keels, the tail is short; the head is large, thick and triangular in shape; vertically elliptical pupil in a distinct medium-sized eye, the body pattern usually being in a chain-like configuration, usually with darker diamonds along the spine and broken bands on the flanks, over a lighter ground-type colour; 10-12 supralabials with 3-4 rows of scales separating the supralabials from the eyes; 25-33 mid body rows, 140-180 ventrals, 40-50 all divided subcaudals, two pairs of chin shields, the front ones noticeably enlarged; separated from all other vipers except the Russell's viper (*Daboia*) by the presence of a dark blotch or stripe running vertically from the top of the mouth into the eye, although this may appear faded in large snakes; separated from the Russell's viper by the less thick-set build of the Russell's viper and the fact that the dark blotch running into the eye is considerably wider than the eye, as opposed to being roughly the same width. The Russell's viper is further separated by its dorsal pattern which is not in the zig-zag configuration seen in this genus. The pattern in *Daboia* is a color pattern consisting of a deep yellow, tan or brown ground color, with three series of dark brown spots that run the length of its body. Each of these spots has a black ring around it, the outer border of which is intensified with a rim of white or yellow, but giving an impression of ovals, smooth circles or similar as opposed to the more typical viperine pattern. The dorsal spots, which usually number 23-30, may grow together, while the side spots may break apart.

Vipers are distinct, usually thick-set snakes with a well developed venom apparatus and large retractable fangs that fold into the mouth when not in use. The thick-set build relates to the ambush predator feeding plan on the snakes.

They have large fangs used to hold prey when bitten and a heavy body with which to hold down struggling prey, usually by force of weight and holding with a stiff neck as the prey is bitten and subdued.

This subgenus (*Laidlawus* subgen. nov.) is distributed in the North Africa region only.

Etymology: Named in honour of Michael Laidlaw of Ringwood for valued services to reptile education, science and conservation.

Species in subgenus *Laidlawus* subgen. nov.

M. deserti (Anderson 1892)

M. mauritanica (Duméril and Bibron 1848)

SUMMARY

Notwithstanding short-term resistance to any changes in existing taxonomy and nomenclature, the evidence is already clearly in support of the taxonomy and nomenclature within this paper.

It is also my firm belief that taxonomists have in the past failed to utilize levels of classification regulated by the ICZN code, including for example subgenus, tribe and subtribe, hence the utilization of subgenus in this paper.

ACKNOWLEDGEMENTS

Many herpetologists in Australia and elsewhere, and other people with no direct interest in reptiles have assisted with this and other projects.

Most have been named previously either at the end of other papers or in the relevant sections of my nine books.

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A reassessment of the Burrowing Asps, *Atractaspis* Smith, 1849 with the erection of a new Genus and two Tribes (Serpentes: Atractaspidae).

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ABSTRACT

The so-called Burrowing Asps or Mole Vipers, Atractaspididae are endemic to Africa and the Middle-east.

As of early 2012, all were placed within a single genus. The genus as defined consisted of 22 recognised species, including quite morphologically diverse forms.

As assessment of all known species has shown that the species-level taxa *Atractaspis microlepidota* Günther, 1866 and the closely related *A. andersonii* Boulenger, 1905 (long regarded as a subspecies of the former) are quite divergent from all others, both in form and habits, most obviously by their smaller dorsal scales and more extensively developed venom apparatus.

These significant differences have been confirmed via a recent study of the microchondrial DNA (Pyron et. al. 2010) indicating an ancient divergence.

As a result, this paper formalises this recognition by erecting a new genus *Hoseraspea* gen. nov. to accommodate two species-level taxa and goes further splits Atractaspididae into two tribes, namely Atractaspidini tribe nov. and Hoseraspini tribe nov..

Keywords: Taxonomic revision; new genus; new tribe; species; *Atractaspis*; *microlepidota*; *andersonii*; *Hoseraspea*; Hoseraspini; Atractaspidini; *bibroni*; *inornatus*; Hoser; Shireen Hoser; asp; small-scaled burrowing asp; burrowing asp; stiletto snake; mole viper; side-stabbing snake.

INTRODUCTION

Published studies relevant to the genus *Atractaspis* as widely recognised, include Corkill, and Kirk, (1954), Deufel and Cundall (2003), Kurnic, et. al. (1999), Minton (1968), Pyron et. al. (2010), Spawls and Branch (1995), Warrall, et. al. (1976) and others.

Between them, their evidence provided a compelling argument to remove the species-level taxa *Atractaspis microlepidota* Günther, 1866 and the closely related *A. andersonii* Boulenger, 1905 (long regarded as a subspecies

of the former) from genus *Atractaspis* (type species being *A. inornatus* Smith 1849, a synonym of *A. bibroni*) and this is now done herein by the formal erection and diagnosis of a new genus in accordance with the Zoological Code (Ride, et. al. 1999).

SUMMARY OF THE GENUS *TRACTASPIS SENSU LATO*

Atractaspis has to date been recognised as a genus of venomous snakes found in Africa and the middle-east.

Currently there are 22 recognised species although final resolution as to the exact number of species involved is likely

to take some time and will in part depend on access to the areas species occur, noting the political instability in some areas.

They are found mostly in sub-Saharan Africa, with the center of species distribution around the vicinity of Congo, with a limited distribution in the middle-east.

They are recognised under various common names including: Burrowing Vipers, Burrowing Asps, Mole Vipers, Stiletto Snakes, Side-stabbing Snakes, all of which relate to their appearance, venomous bites or burrowing habits.

They are smallish snakes, rarely exceeding 1 metre total length and usually mature at about 45 cm.

The venom apparatus and fangs in particular are well developed and the snakes can often bite from the side, which reflects in one of their common names. This unusual feature makes these snakes risky to handle by using the usual "hand gripping neck" methods, due to the heightened risk of "needle-stick" wound from one of the sideways oriented fangs.

There are a few teeth on the palatines, none on the pterygoids; mandibles edentulous anteriorly, with 2 or 3 very small teeth in the middle of the dentary bone. There's no postfrontal bone. The head is small and indistinct from the neck and covered with large symmetrical shields; nostril is set between 2 nasals; no loreal; eye is minute, with a round pupil and one or two labials entering the orbit. The body is cylindrical and of similar thickness along its entire length; the dorsal scales smooth and shiny, without apical pits, in 17 to 37 rows (but see the new genus description below); ventrals are rounded. Tail short; subcaudals are either single or divided.

These snakes are designed for a burrowing existence and are usually drab in appearance, being typically a blackish colour.

GENUS *HOSERASPEA* GEN. NOV.

Type species: *Atractaspis microlepidota* Günther, 1866

Diagnosis: Genus *Hoseraspea* gen. nov. is separated from all species in the genus *Atractaspis* by having 29 to 37 mid body rows (of dorsal scales) (versus 25 or less in all *Atractaspis*), a number higher than seen in any species of *Atractaspis*: there are 212-245 ventrals; single anal and 26-37 single subcaudals, there are six supralabials, numbers 3 and 4 entering the orbit.

They are smallish snakes, never exceeding 75 cm total length and usually mature at about 45 cm.

Hoseraspea gen. nov. develops long venom glands, whereas *Atractaspis* develops short venom glands.

The venom apparatus and fangs in particular are well developed and the snakes can often bite from the side, which reflects in one of their common names. This unusual feature makes these snakes risky to handle by using the usual "hand gripping neck" methods, due to the heightened risk of "needle-stick" wound from one of the sideways oriented fangs.

There are a few teeth on the palatines, none on the pterygoids; mandibles edentulous anteriorly, with 2 or 3 very small teeth in the middle of the dentary bone. There's no postfrontal bone. The head is small and indistinct from the neck and covered with large symmetrical shields; nostril is set between 2 nasals; no loreal; eye is minute, with a round pupil.

The body is cylindrical and of similar thickness along its entire length; the dorsal scales smooth and shiny, without

apical pits, ventrals are rounded. Tail is short.

These snakes are designed for a burrowing existence and are usually drab in appearance, being typically a blackish colour.

Distribution: *Hoseraspea microlepidota* is found in West Africa including Nigeria, Benin and Togo, extending east towards East Africa in Sudan.

H. andersoni is found in southwestern Saudi Arabia and Oman.

Common name: Small-scaled burrowing Asp.

Other common names (less used): Small-scaled Stiletto Snake, Small-scaled Side Stabbing Snake, Small-scaled Mole Viper, Small scaled-burrowing Adder

The common name Small-scaled Burrowing Asp, is particularly apt as the smaller scales (reflecting in a higher mid-body scale row count) differentiates this genus from *Atractaspis*.

Etymology: Named in honour of my long-suffering wife, Shireen Hoser, who happens to come from the same part of the world where the Burrowing Asps come from, namely Africa.

Instead of getting marital bliss when she married me in 1999, she's had to cope with ongoing harassment and hardship in all forms of outside attacks, including heavily armed police raids, the unfortunate consequence of myself being one of Australia's best known whistleblowers on government corruption within this country.

If I had not married her, it's likely that I'd never have been to Africa to see these wonderful snakes.

SPECIES WITHIN THE GENUS *HOSERASPEA* GEN. NOV.

Hoseraspea microlepidota (Günther, 1866)

Hoseraspea andersoni (Boulenger, 1905)

Species remaining in the genus *Atractaspis*

Atractaspis aterrima Günther, 1863

Atractaspis battersbyi De Witte, 1959

Atractaspis bibronii Smith, 1849

Atractaspis boulengeri Mocquard, 1897

Atractaspis coalescens Perret, 1960

Atractaspis congica Peters, 1877

Atractaspis corpulenta (Hallowell, 1854)

Atractaspis dahomeyensis Bocage, 1887

Atractaspis duerdeni Gough, 1907

Atractaspis engaddensis Haas, 1950

Atractaspis engdahli Lönnberg and Andersson, 1913

Atractaspis fallax Peters, 1867

Atractaspis irregularis (Reinhardt, 1843)

Atractaspis leucomelas Boulenger, 1895

Atractaspis magretti Scortecci, 1928

Atractaspis micropholis Günther, 1872

Atractaspis phillipsi Barbour, 1913

Atractaspis reticulata Sjöstedt, 1896

Atractaspis scorteccii Parker, 1949

Atractaspis watsoni Boulenger, 1908

HIGHER CLASSIFICATION

While it may be regarded as trite by some people for me to herein formalize the higher level of classification for a small group of snakes such as the Atractaspidae, I regard it as

important from the point of view of consistency at all levels of classification across all families of the Serpentes when reconciled with morphological and known genetic differences (refer for example to the results of Prynor et. al. 2010, Fig. 2). Therefore I herein formally erect and diagnose a new monotypic tribe to accommodate *Hoseraspea* namely Hoseraspini tribe nov. and separate the component species from the other genus in the family, which by default will, as presently recognised be placed in it's own monotypic tribe (Atractaspini tribe nov.) which is also herein described, defined and named below.

TRIBE HOSERASPINI TRIBE NOV.

(Terminal Taxon: *Hoseraspea microlepidota*)

Diagnosis: Tribe Hoseraspini tribe nov. is separated from all species in the tribe Atractaspini by having 29 to 37 mid body rows (of dorsal scales) (versus 25 or less in all Atractaspini), a number higher than seen in any species of Atractaspini: there are 212-245 ventrals; single anal and 26-37 single subcaudals, there are six supralabials, numbers 3 and 4 entering the orbit.

They are smallish snakes, never exceeding 75 cm total length and usually mature at about 45 cm.

Hoseraspini tribe. nov. develops long venom glands, whereas Atractaspini develops short venom glands.

The venom apparatus and fangs in particular are well developed and the snakes can often bite from the side, which reflects in one of their common names. This unusual feature makes these snakes risky to handle by using the usual "hand gripping neck" methods, due to the heightened risk of "needle-stick" wound from one of the sideways oriented fangs.

There are a few teeth on the palatines, none on the pterygoids; mandibles edentulous anteriorly, with 2 or 3 very small teeth in the middle of the dentary bone. There's no postfrontal bone. The head is small and indistinct from the neck and covered with large symmetrical shields; nostril is set between 2 nasals; no loreal; eye is minute, with a round pupil.

The body is cylindrical and of similar thickness along it's entire length; the dorsal scales smooth and shiny, without apical pits, ventrals are rounded. Tail is short.

These snakes are designed for a burrowing existence and are usually drab in appearance, being typically a blackish colour.

Content: *Hoseraspea* gen. nov. (this paper) Hoser, 2012.

TRIBE ATRACTASPINI TRIBE NOV.

(Terminal Taxon: *Atractaspis bibroni*)

Diagnosis: Tribe Atractaspini tribe nov. is separated from all species in the tribe Hoseraspini tribe nov. by having 25 or less dorsal mid body rows of snakes, versus 29 to 37 mid body rows (of dorsal scales) in Hoseraspini,

Hoseraspini tribe. nov. develops long venom glands, whereas Atractaspini develops short venom glands.

These are smallish snakes, never exceeding 75 cm total length and usually mature at about 45 cm.

Atractaspini develops short venom glands whereas Hoseraspini tribe. nov. develops long venom glands.

The venom apparatus and fangs in particular are well developed and the snakes can often bite from the side, which reflects in one of their common names. This unusual feature makes these snakes risky to handle by using the usual "hand gripping neck" methods, due to the heightened risk of

"needle-stick" wound from one of the sideways oriented fangs.

There are a few teeth on the palatines, none on the pterygoids; mandibles edentulous anteriorly, with 2 or 3 very small teeth in the middle of the dentary bone. There's no postfrontal bone. The head is small and indistinct from the neck and covered with large symmetrical shields; nostril is set between 2 nasals; no loreal; eye is minute, with a round pupil.

The body is cylindrical and of similar thickness along it's entire length; the dorsal scales smooth and shiny, without apical pits, ventrals are rounded. Tail is short.

These snakes are designed for a burrowing existence and are usually drab in appearance, being typically a blackish colour.

Content: *Atractaspis* Günther, 1858.

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A taxonomic revision of the colubrinae genera *Zamenis* and *Orthriophis* with the creation of two new genera (Serpentes:Colubridae).

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ABSTRACT

The Colubridae have recently been subject of several major taxonomic revisions.

Molecular studies by Utiger, et. al. 2002 (specific to the Colubridae) led to the erection of two new genera within the *Elaphae* (sensu lato) group.

Pyron et. al. (2010) in a global review of the snakes, presented data that highlighted taxonomic inconsistencies in terms of the definition of the genus level for a small percentage of the world's thousands of species of advanced snakes.

Two colubrid genera of snakes, namely; *Zamenis* Wagler, 1830 and *Orthriophis* Utiger et. al., 2002 (both groups commonly known as ratsnakes) have been included in several recent molecular and multivariate studies. They have consistently been found to be paraphyletic at the genus level.

As a result of this unavoidable reality, both groups of snakes are reclassified herein.

In terms of the five species within the nominate genus *Zamenis*, *Zamenis* retains the species *Z. longissimus* and *Z. lineata*, the genus *Callopeltis* Fitzinger, 1834 is resurrected for the species *Z. situla*, while a new genus *Richardwellsus* gen. nov. is formally erected and named to accommodate the species *persica* and *hohenackeri*.

For the four species currently in the genus *Orthriophis*, *O. taeniurus* and *O. moellendorffi*, remain within that genus, while a new genus *Martinekea* gen. nov. is formally erected and named to accommodate the species *O. cantoris* and *O. hodgsoni*.

Keywords: taxonomic revision; taxonomy; new genus; new genera; *Richardwellsus*; *Martinekea*; *Zamenis*; *Callopeltis*; *Orthriophis*; *Elaphe*; *colubridae*; Martinek; Koala; Scam; Richard Wells; taxonomist; systematics; nomenclature; Maryann Martinek; Hoser; snake; *longissimus*; *lineata*; *situla*; *persica*; *hohenackeri*; *taeniurus*; *moellendorffi*; *cantis*; *hodgsoni*.

INTRODUCTION

Ratsnakes are medium to large snakes that usually kill their prey by constriction.

They occur through a great portion of the Holarctic region. They feed primarily on rodents and birds.

With some species exceeding 3 m (10 feet), they can occupy the top level of some food chains as an alpha predator. Due to their tractability with humans, many are kept as pets, with the North American Corn Snake being one of the staples of the global pet trade, known as "Herpetoculture". While some ratsnake species can be skittish and sometimes "aggressive" to handlers, bites are regarded as not being a serious medical issue due to the relatively weak biting force and the lack of any toxic venom.

Until the latter part of the twentieth century most ratsnakes were assigned to the "catch all" genus *Elaphe* Fitzinger 1833.

However as a result of several major studies, old generic names for some species groups have been resurrected. Where none have been available, new names have been proposed and generally moved into acceptance by other herpetologists.

In a landmark study, Utiger, et. al. (2002) inferred phylogenetic relationships of the Holarctic ratsnakes (*Elaphe sensu lato*) after analysing portions of two mitochondrial genes 12S rRNA and COI.

They assigned ten species to *Elaphe* Fitzinger, the (type) species *longissima*, to *Natrix Laurenti* and four western Palaearctic species to *Zamenis* Wagler. The west European *Rhinechis scalaris* remained monotypic for that genus and the authors erected a new genus to accommodate the east Asian *Coluber porphyriacus* Cantor, namely *Oreophis*, Utiger et. al. 2002.

Four oriental species were placed into another new genus erected, namely *Orthriophis*, Utiger et. al. 2002.

The authors found the new world ratsnakes and allied genera to be broadly monophyletic. *Coluber flavirufus* Cope 1867 was referred to *Pseudoelaphe* Mertens and Rosenberg 1943. *Pantherophis* Fitzinger 1843 was revalided for *Coluber guttatus* L. (type species) and further Nearctic species (*bairdi*, *obsoletus* and *vulpinus*).

Senticolis triaspis was found to be a sister taxon of New World ratsnakes, including genera *Arizona*, *Bogertophis*, *Lampropeltis*, *Pituophis* and *Rhinochelus*. The East Asian *Coluber conspicillatus* Boie 1826 and *Coluber mandarinus* Cantor 1842, apparently formed a monophyletic group and were referred to *Eupriophis* Fitzinger 1843. Three old world species with *Elaphe sensu lato bella*, (s.l.) *frenata* and (s.l.) *prasina* remained unassigned. The various groups of ratsnakes (all within tribe Lampropeltini) showed characteristic hemipenis features.

These results have been revisited by several taxonomists since 2002 and mostly stood up to robust scrutiny. However several studies, including Pyron et. al. (2002) have found the two genera *Zamenis* and *Orthriophis* to be paraphyletic at the genus level based on the molecular data and when the genus level is defined consistently across a broad range of colubrid taxa.

Revisiting the data of Utiger et. al., confirms this position, indicating that the placement of species within the genera *Zamenis* and *Orthriophis* was too conservative, even on the basis of the data they presented in their 2002 paper (refer specifically to figs 3 and 4).

As a result of these results, the position outlined in the abstract above has been taken by myself.

In terms of the five species within the nominate genus *Zamenis*, *Zamenis* retains the species *Z. longissimus* and *Z. lineata*, the genus *Callopeltis* Fitzinger 1834 is resurrected for the species *Z. situla*, while a new genus *Richardwellsus* gen. nov. is formally erected and named to accommodate the species *persica* and *hohenackeri*.

For the four species currently in the genus *Orthriophis*, *O. taeniurus* and *O. moellendorffi*, remain within that genus, while a new genus *Martinekea* gen. nov. is formally erected and named to accommodate the species *O. Cantoris* and *O. hodgsoni*.

GENUS ZAMENIS WAGLER, 1830

These ratsnakes grow to between 60-140 cm in total length as adults and are moderately built snakes. Scalation is 192-255 ventrals, 21-27 dorsal mid body rows, 51-92 subcaudals.

Preferred habitat is dry open woodlands and shrubland, field edges, traditionally cultivated land, stone walls, old buildings and of course broken down old buildings and rubbish dumps. It can be found from sea level to 1,600 metres in altitude.

Zamenis are easily separated from all other *Elaphe sensu lato* by the presence of a distinct basal hook on the hemipenis instead of more or less uniform spines as in *Elaphe*.

These snakes have been extensively studied, in terms of morphology, taxonomy, habits and captivity, with important studies published by Afrasiab et. al. (2011), Bennemann (2007), Beshkov and Nanev (2006), Bezman-Moseyko (2010), Böttger (1880), Burbin and Lawson (2007), Capula, et. al. (2006), Capula, et. al. (2008), Coppen (1995), Dusej (1986), Frynta et. al. (1997), Guiller (2009), Helfenberger (2001), Joger, et. al. (2007), Kammel (2009), König (1985), Krofel (2004), Kwet (2007), Lenk, et. al. (2001), Lenk and Wüster (1999), Mattison (1997), Niebergall (2003), Nilson and Claes (1984), Petrov, et. al. 2006, Pottier, et. al. 2008, Schätti and Baran (1988), Schätti et. al. (2010), Schlüter (2006), Schlüter (2009), Schulz (1996), Schreiber (2009), Schweiger (1994), Sehnaal and Schuster (1999), Sigg (1984), Sindaco et. al. (2000), Sos (2008), Stevens (1995), Strödicke and Gerisch (1999), Vaccaro and Turrisi (2007), Utiger, et. al. (2002) and Utiger, et. al. (2005), Venchi and Sindaco (2006), Waitzmann (1993), Werning (2003), Wirth (2009) and Wütschert (1984).

As of early 2012, *Zamenis* currently included four known western Palaearctic species.

These are *Natrix longissima* Laurenti 1768 (type species), *Coluber hohenackeri* Straunch 1873, *Callopeltis longissimus* var. *lineata* Camerano 1891 (see also *Coluber romanus* Suckow 1798), *Coluber longissima* var. *persica* Werner 1913 and *Coluber situla* Linnaeus 1758.

The genus as traditionally understood can be easily split three ways on morphological characteristics.

The species taxa *lineatus* and *longissimus* have a bulbous apex of the hemipenis whereas it is subcylindrical in the remaining three species (for detail see fig 5, in Utiger et. al. 2002).

The species taxon *situla* is separated from the other four species by scalation. It has 25-27 dorsal mid body scale rows, versus 21-23 in all other species formerly placed within *Zamenis*. It is herein placed in the genus *Callopeltis* Fitzinger 1834.

Converse to the situation seen in *lineatus* and *longissimus* the apex of the hemipenis is subcylindrical rather than bulbous in the taxa *persica* and *hohenackeri*. They are herein placed in the genus *Richardwellsus* gen. nov.

GENUS RICHARDWELLSUS GEN. NOV.

Type species: *Coluber longissima* var. *persica* Werner, 1913

Diagnosis: Separated from all other ratsnakes formerly placed in the genus *Zamenis* by the following:

Converse to the situation seen in *Z. lineatus* and *Z. longissimus* the apex of the hemipenis is subcylindrical rather than bulbous in the taxa placed in the genus *Richardwellsus* gen. nov., namely *R. persica* and *R. hohenackeri*;

The species taxon *situla* (also formerly of *Zamenis*) is separated from this genus by scalation. It has 25-27 dorsal mid body scale rows, versus 21-23 in all other species; it is herein placed in the genus *Callopetlis* Fitzinger 1834, *C. situla* has similar hemipenal morphology to snakes in the genus *Richardwellsus* gen. nov.;

The preceding diagnosis can also be used as a diagnosis for each of the genera *Zamenis* and *Callopetlis*.

Richardwellsus gen. nov. can be further separated from the genera *Zamenis* and *Callopetlis* by the presence of lower ventral keels.

Callopetlis is usually greyish in body colour with pattering in the form of red blotches, stripes or a combination of both. The blotches are often etched with black.

Richardwellsus gen. nov. and *Zamenis* are variable in colour and various mutations for the given species in captivity add to the variety of phenotypes likely to be seen.

The species *R. persica* is essentially confined to Iran. The species *R. hohenackeri* occurs widely in the middle-east in an area bound by Turkey in the West, Iran in the East, Georgia in the North and Israel in the south.

Callopetlis situla is found in an area broadly bounded by Turkey in the south-west, Ukraine in the North, Poland in the North-west and Italy in the south-west.

Zamenis lineatus is confined to Italy, mainly in the region of Naples, while *Z. longissimus* is found in most parts of continental Europe in an arc spreading south-east to Iran.

Etymology: Named after a well-known Australian taxonomist Richard W. Wells. While he has been lampooned by other so-called herpetologists who have highlighted his many errors, mistakes and blunders, it is the far greater number of things that he got correct in his published studies that will ultimately be his legacy. Many of these were conclusions he made that were well beyond the popular thinking of his time.

I shall also relate some personal experience I had with Richard Wells that will add context to what he's published.

As a high school student in the early 1970's I recall sitting in meetings of the Australian Herpetological Society at the Australian Museum in William Street, Sydney, Australia.

Speakers would attend each month and show countless slides of reptiles of all shape and form from their travels in remote parts of Australia.

By and large, nobody had a clue about many of the smaller and more obscure species. The notable exception was Richard Wells. If the species had a name, he knew it and he was able to identify pretty much everything that was shown and even down to locality.

While his major papers of 1983 and 1985 (Wells and Wellington 1983, Wells and Wellington 1985) have been widely criticised for their extreme brevity of important descriptive and diagnostic information, it would be foolish for critics to assume that this was due to a lack of detailed knowledge by Wells at the time he wrote those papers.

More relevant, is that this detailed expertise of Wells is why

so many of his alleged "guesses" in terms of taxonomy have long since been shown to be "lucky" or correct.

Species in genus *Richardwellsus* gen. nov.

Richardwellsus persica (Common name is Persian Ratsnake)

Richardwellsus hohenackeri (Common name is Transcaucasian Ratsnake)

Species in the genus *Callopetlis* Fitzinger 1834.

Callopetlis situla (Common name is Leopard Snake)

Species remaining in the genus *Zamenis* Wagler, 1830

Zamenis longissimus (Common name is Aesculapian Ratsnake)

Zamenis lineata (Common name is Italian Lined Ratsnake)

GENUS ORTHRIOPHIS UTIGER ET. AL. 2002

Named from the Greek word *orthros* meaning dawn and *ophis*, i.e. snake, with a masculine gender, the genus name relates to the documented early morning activity of members of the species.

The snakes are of medium build with a long and slender head. Scalation ranges from 19-27 dorsal mid-body scale rows, 212-305 ventrals and 222-272 precaudal vertebrae.

Until now the genus has included four species, namely *taeniurus*, *moellendorffi* (the type species "hoc loco" Utiger et. al. 2002, p. 119), *cantoris* and *hodgsoni*, the latter two assigned to the genus *Martinekea* gen. nov. (see below).

Adult size attained is up to 2.3 metres in *taeniurus*. All have bilobed hemipenes without basal hooks.

Studies of Snakes within the genus *Orthriophis* as defined by Utiger et. al. are many, and include the following: Barone (2003), Cox, et. al. (1998), Gumprecht (2003a), Gumprecht (2003b), Gumprecht (2004a), Gumprecht (2004b), Günther (1860), Hobcroft and Schultz (2010), Ji. et. al. (1999), Kramer (1977), Ryabov and Popovskaya (2000), Schultz (1996), Schultz (2010), Wang, et. al. (1999), Zhao and Adler (1993), Zhao and Li (1987) and Ziegler et. al. (2007).

GENUS MARTINEKEA GEN. NOV.

Type species: *Spilotes hodgsonii* Günther 1860

Diagnosis: Separated from all other *Orthriophis* by the following suite of characteristics: the hemipenis of the component species present as relatively narrow at the base, widening significantly towards the lobes, yielding a fairly large "heart shaped" profile; by contrast in the two species remaining in *Orthriophis* the hemipenis is usually more even in thickness from the base to the end of the lobes and while widening as well, it does not present in the more characteristic triangular or heart-shaped profile seen in *Martinekea* gen. nov..

In this genus, the subocular is generally absent, while usually present in the remaining *Orthriophis*.

Scalation in *Martinekea* gen. nov. is smooth with 212-247 ventrals, 65-78 subcaudals and 21-25 dorsal mid-body rows.

The number of subcaudals (78 or less) separates the genus *Martinekea* gen. nov. from *Orthriophis* which always has more than 82 subcaudals.

Habits include a preference for moist areas, especially forests and even jungle. These snakes sometimes occur in dry forests and edges of fields, especially those that are in close proximity to water or wetter habitats..

Martinekea gen. nov. occur at altitudes ranging from 1,000 and 3,200 m. Distribution of the genus includes The Himalayas and nearby hills towards Burma (Myanmar)

including Tibet (China).

The genera *Martinekea* gen. nov. and *Orthriophis* are separated exclusively by distribution and habitat areas where the species may otherwise be sympatric.

Martinekea gen. nov. is unknown from elevations below 1,000 metres, while *Orthriophis* is unknown from elevations above 800 metres.

The distribution of the two genera, while partially overlapping in the east Himalayas and nearby hilly areas, is mainly mutually exclusive, with *Orthriophis* being centred in the region of North Vietnam and China.

Etymology: Named after a retired Australian army major, Maryann Martinek.

In 2009 to 2010 along with myself she played an important role in exposing a scam.

The scam involved corrupt officers within the Victorian Wildlife Department (DSE) and a Country Fire Authority (CFA) employee who contrived to make footage of a male Koala drinking from a bottle in a bushfire zone, falsely claiming the bottle-raised pet was in fact an injured fire victim. The people involved in the scam then unlawfully fleeced several hundred thousand dollars from well-meaning people in the form of "donations" thereby effectively stealing money from worthwhile charities in desperate need of money.

Martinek paid the ultimate price of blowing the whistle against a department and the officials noted for their criminal activities and aggressive hatred of those who expose them. In her case she was harassed by staff who unlawfully tagged her at home and work.

Then there were the associated "stalkers" and staff who spent most of the time working as internet "trolls" who spread false and defamatory material about her on the internet and through search engine optimisation methods (SEO) ensured that anyone who searched for her by name would be directed to false and defamatory claims. The DSE staff then abused a quasi legal process and with a high-powered team of lawyers, literally outgunned her and financially destroyed her. All this came from a so-called government wildlife department that was supposed to be protecting the environment and not harassing corruption whistleblowers.

It's therefore fitting that a courageous woman such as Maryann Martinek should be honoured to have a genus of snakes carry her name.

Details of the scam itself were published by Hoser (2010), in a 64-page volume of *Australasian Journal of Herpetology* Issue number 8.

Species in the genus *Martinekea* gen. nov.

Martinekea hodgsonii (common name is Hodgson's Ratsnake)

Martinekea cantorisi (common name is Cantor's Ratsnake)

Species remaining in the genus *Orthriophis* Utiger et. al. 2002

Orthriophis taeniurus (type species) (common name is Beauty Snake)

Orthriophis moellendorffi (common name is 100 Flower Ratsnake)

SUMMARY

Notwithstanding short-term resistance to any changes in existing taxonomy and nomenclature, the evidence is already clearly in support of the taxonomy and nomenclature within this paper and hence both new genera names are likely to

move into common usage within a short period of time after this publication.

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Most have been named previously either at the end of other papers or in the relevant sections of my nine books.

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