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Boiga irregularis (Bechstein, 1802): An invasive species complex busted! (Serpentes: Colubridae).

RAYMOND T. HOSER

488 Park Road, Park Orchards, Victoria, 3134, Australia.
***Phone*: +61 3 9812 3322 *Fax*: 9812 3355 *E-mail*: snakeman (at) snakeman.com.au**
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ABSTRACT

The Brown Tree Snake *Boiga irregularis* (Bechstein, 1802) is a taxon that achieved notoriety after it was inadvertently introduced into the island of Guam. There it proceeded to breed in massive numbers and decimated the local lizards and avifauna (Rodda and Fritts 1992, Rodda and Savidge 2007).

While various forms have been formally described, most authors have treated all as being variants of a single species. This remains the case even since a molecular study by Richmond *et al*. (2014) showed that there were deep phylogenetic divisions between populations.

Rodda *et al.* (1999) and again Rodda and Savidge (2007) noted this incongruity and for nearly a decade since 2007, there has been no advancement in that position. Furthermore the anomaly becomes even more apparent when one reconciles this situation with that of another related species complex *Dorisious dendrophila* (Boie, 1827), formerly known as *Boiga dendrophila* (Boie, 1827), a Sundaland species for which local populations exhibit similar divergences and have been assigned widely-recognized and used subspecies names for many years. These including six more than 100 years old and three more recent.

This paper corrects the anomaly and divides the *B. irregularis* group based on consistent morphological differences between forms. These also coincide with available molecular data.

The result here is ten subspecies, four of which have available names and the other six are assigned in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride *et al*. 1999).

A neotype is designated for *B. irregularis.*

Keywords: Taxonomy; Brown Tree Snake; snakes; genus; *Boiga*; species; *irregularis*; *fusca*; *laticeps*; *flavigastra*; *boydii*; *ornata*; *flavescens*; new subspecies; *halmaheraensis*; *buruensis*; *sudestensis*; *solomonensis*; *newbritainensis*; *roddai*; Solomon Islands; Solomons; Australia; Queensland, New South Wales, Northern Territory, Western Australia; New Guinea; Guam; Sulawesi; Obi; Guadalcanal; Halmahera; New Britain; Milne Bay; Tagula; Sudest Island; Buru; Ambon; Manus; Ceram.

INTRODUCTION

The Brown Tree Snake *Boiga irregularis* (Bechstein, 1802) is a species that achieved notoriety after it was inadvertently introduced into the island of Guam. There it proceeded to breed in massive numbers and decimated the local reptiles and avifauna as noted by Rodda and Fritts (1992) and Rodda and Savidge (2007).

This notoriety and environmental destruction has led to numerous studies and published obersations in relation to these snakes including their various means of human assisted and non-human assisted dispersion, including transportation methods, speed of travel and the like.

Similar species within the genus *Boiga sensu lato* as described by Hoser (2012) have also been studied in detail.

Most wide-ranging species within *Boiga sensu lato* have had regional subspecies formally described and named and these names are widely used.

While various forms of *Boiga irregularis* from Australia and New Guinea have been formally described, most authors have treated all as being variants of a single species and this has also been the case for most biological and captive studies on these snakes. This treatment of all "*Boiga irregularis*" as a single taxon remains the case even since a molecular study by Richmond *et al.* (2014) showed that there were deep phylogenetic divisions between populations.

Rodda *et al.* (1999) and again Rodda and Savidge (2007) noted this incongruity and for nearly a decade since 2007, or two since 1999, there has been no advancement in that position.

In 2007, Rodda and Savidge wrote: "Most island isolates of Brown Tree Snakes do show genetic structure, but no distinctive forms have been formally recognized."

Furthermore the anomaly becomes even more apparent when one reconciles this situation with that of another species complex *Dorisious dendrophila* (Boie, 1827), formerly known as

Boiga dendrophila (Boie, 1827), better known as the Mangrove Snake, which is a Sundaland species for which local populations exhibit similar divergences and have been assigned widely-recognized and used subspecies names for many years. These include six more than 100 years old and three more recently assigned.

It is also notable that *Dorisious dendrophila* (Boie, 1827), would clearly be more suited to dispersal among nearby island groups than the species *B. irregularis*, which while inhabiting mangrove swamps and/or regularly venturing into them, does in fact prefer more *terra-firma* land-based habitats.

This paper corrects the anomaly, and divides the *B. irregularis* group based on consistent morphological differences between forms. These also coincide with the molecular data.

The basis of the division includes direct inspection of many hundreds of specimens, both live and in museums, over a fourty year period from across most parts of the known distributuion of *Boiga irregularis.*

This includes specimens from Australia, New Guinea, the Solomon Islands, and other islands, north and west of New Guinea.

The result here is ten identified subspecies, four of which have available names, with three being resurrected from synonymy.

The other six subspecies are assigned new names in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

The taxonomy is robust and conservative. While no populations are currently regarded as threatened with extinction, things can change rapidly. A necessary first step to conserving biodiversity is to have a proper inventory of it, which is further reason for these descriptions to be published now, rather than at a later date.

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

This is in view of the conservation significance attached to the formal recognition of unnamed species and on the basis that further delays may in fact put these otherwise unnamed taxa at greater risk of extinction should their status in the wild unexpectedly change.

A situation compounding the problems involving taxonomy and nomenclature of *B. irregularis* has been the absence of a type specimen. The original description matches that of the east Australian form and so it is appropriate that this be regarded as the form typical of the species. Most contemporary authors (e.g. Rodda and Savidge 2007) have done exactly that.

On that basis I hereby assign a neotype for the species *B. irregularis* which is done preceding the relevant subspecies descriptions.

Also it is relevant to point out that the earlier named subspecies were never properly defined by the original authors within the context of other forms. Hence these are redescribed herein in order to enable others to identify and separate each of the ten named forms and in the absence of relevant locaility data.

MATERIALS AND METHODS

These are not formally explained in a number of my recent papers under the heading “Materials and methods” or similar, on the basis they are self evident to any vaguely perceptive reader. However, the process by which the following taxonomy and nomenclature in this and other recent papers by myself of similar form (in *Australasian Journal of Herpetology* issues 1-32), has been arrived at, is explained herein for the benefit of people who have recently published so-called “criticisms” online of some of my recent papers. They have alleged a serious “defect” by myself not formally explaining “Materials And Methods” under such a heading.

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

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

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

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

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

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

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

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

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

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

This means that if a name has been properly proposed in the past, it is used. This is exactly what happens in this paper for four different taxa referred to within.

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

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

The published literature relevant to *Boiga irregularis sensu lato* and the taxonomic and nomenclatural judgements made within this paper includes papers relevant to other Australian, New Guinea, East Indonesia and Pacific Island species affected by the same physical barriers to dispersion as well as those directly relevant to *Boiga*. Combined, this literature includes the following:

Adler, *et al.* (1995), Austin (2000), Austin *et al.* (2010), Balsai (1995), Barbour (1921), Bauer and Günther (2013), Bechstein (1802), Boulenger (1884, 1886, 1890, 1893), Bruns *et al.* (1989), Buden and Taboroši (2016), Buden *et al.* (2001, 2014), Cogger (1972, 2014), Cogger *et al.* (1983), Crotty and Jayne (2014), Dahl (1986), Daudin (1802), Daza *et al.* (2015), de Rooij (1917), Duméril and Bibron (1839, 1844, 1854), Escoriza Boj (2005), Fischer (1884), Fritts and Rodda (1998), Fritts (1988), Gray

(1842, 1856), Greer (1982), Greer and Parker (1967), Groen (2008), Hagen *et al.* (2012), Hall (2002), Hoser (1980, 1989, 2012), ICZN (1986), in den Bosch (1985), Iskandar and Erdelen (2006), Jackson and Jackson (2010), Jackson and Perry (2000), Jacquinot and Guichenot (1853), Jordan and Rodda (1994), Keogh *et al.* (2003), Kinghorn (1928, 1937), Koch *et al.* (2009), Kraus (2015), Lardner *et al.* (2014), Longman (1915, 1918), Macleay (1877, 1884, 1888), Mason *et al.* (2011), Mathies and Miller (2003), Mathies *et al.* (2010), Mayer (2014), McCoid *et al.* (1994), McCoy (1980, 2006), McDiarmid *et al.* (1999), McDowell (1970), McFadden and Boylan (2014), Mys (1988), Ogilby (1890), Orlov and Ryabov (2002), Orlov *et al.* (2003), O'Shea (1996), Pianka and Vitt (2003), Pyron *et al.* (2013), Ramadhan *et al.* (2010), Reeder (2003), Richmond *et al.* (2014), Rodda and Fritts (1992), Rodda and Savidge (2007), Rodda *et al.* (1999), Russell and Coupe (1984), Schmidt (2012), Schmidt (1932), Setiadi and Hamidy (2006), Siers *et al.* (2014), Somaweera (2009), Switak (2006), Wanger *et al.* (2011), Wells and Wellington (1985), Werner (1899a, 1899b), Wilson and Swan (2010) and sources cited therein.

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

It should be noted that *Coluber irregularis* Bechstein, 1802 is the type species of the genus *Boiga*, Fitzinger. The name *Ibiba* Gray, 1825, as suppressed under the plenary powers in in ICZN Opinion 1374, has been placed by the ICZN on the Official Index of Rejected and Invalid Generic Names in Zoology (ICZN 1986).

DESIGNATION OF A NEOTYPE FOR *BOIGA IRREGULARIS* (BECHSTEIN, 1802)

To remove potential confusion and instability in the taxonomy of this species group, a neotype for the snake originally described as *Coluber irregularis* Bechstein, 1802 is designated herein, in accordance with Article 75 of the current ICZN code (Ride *et al.* 1999)(as amended).

Cogger *et al.* (1983) determined that all type material and data had been lost.

They also detailed the relevant status of each of the holotypes of what they described as synonyms and these may or may not be treated by other authors as being of different taxa.

In accordance with Article 75.3 of the code it is herein noted that there is further potential for recognition of further species or subspecies within what is now identified as *Boiga irregularis* if and when futher

collection of material within the relevant region is done.

As a result of these relevant factors and under Article 75.3.1 of the code the neotype is assigned to clarify the status of "typical" *B. irregularis*, as outlined by other herpetologists in the past (e.g. Rodda and Savidge 2007) to be a reference point for the taxon.

Under Article 75.3.2 of the code, I refer to the diagnosis of the species-group taxon *B. irregularis* on page 142 of Hoser (1989), being for the description of the "brick-red phase with some black markings is found east of Cape York and along the east coast." Also depicted in the images numbers 367 and 368 on the same page which form part of that description that being part of the description of the neotype herein.

Under Articles 75.3.3. and 75.3.7. of the ICZN code, I herein designate the neotype for *Coluber irregularis* Bechstein, 1802, now known as *Boiga irregularis* (Bechstein, 1802), as a specimen in the Australian Museum, Sydney, NSW, Australia, specimen no. R.8024, from Church Point, near West Head and Pittwater, NSW. Latitude -33.65, Longitude 151.28.

For a description of the neotype, refer to images numbers 367 and 368 on page 142 of Hoser (1989) for the snake's salient features, noting that as a preserved specimen, the relevant colouration is faded.

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

The three relevant animals (neotype and those depicted in images numbers 367 and 368 on page 142 of Hoser (1989) all come from within or the boundary of Kurringai Chase National Park, in New South Wales, Australia and are of the same general form and appearance and relevant taxonomic features.

Under Article 75.3.4. I herein state that the original holotype specimen for *Coluber irregularis* Bechstein, 1802, has apparently been permenantly lost and searches have been unable to locate it. Refer to the summary of relevant events on page 209 of Cogger *et al.* (1983).

Based on the original description of the holotype by Bechstein (1802), the neotype matches the same species within the description and may well be from the same regional location. Relevant to article 75.3.5 of the code, this detail has been corroborated by Rodda and Savidge (2007).

In accordance with Article 75.3.6 of the code, I note that the type locality of the original holotype is not known, other than obviously being the general region it could possibly come from (in or near Australia and most likely eastern Australia).

However the description of the holotype excludes outlier locations including island groups where congeneric snakes do not match the original species descriptions (refer again to Rodda and Savidge 2007).

***BOIGA IRREGULARIS* (BECHSTEIN, 1802).**

Holotype: Lost. Neotype described above.

Diagnosis: The species *B. irregularis* and all subspecies described herein are separated from all other snakes by the following suite of characters:

The body shape is very slender, with a mass of about 100 g for an average 1,000-mm SVL individual. Colour is usually reddish, orange or brown or a combination of these, either patterned, unpatterned or indistinctly marked in varying configurations, sometimes taking on a whitish grey appearance prior to shedding skin. Scales or interstitial skin may be marked with black or other darker pigment, either in the form of blotches, flecks, scale edging or similar. Attains up to about 2 metres maximum length, with most non-growing adults about 1.2 metres.

Tail is more or less round in cross section and tapering to a point. There is a single loreal scale, a single row of enlarged ventral scales, numbering from 217-286, 17-23 dorsal mid-body rows, anal plate either single or divided, 65-130 all divided subcaudals, standard colubrid head shields, there are sometimes transversely enlarged middorsal scales, head shape is with a blunt short snout with wide quadrates (relative to neck) and large eyes with an elliptical pupil.

Distribution: Naturally occurs along the east and north coasts of Australia, stretching from north of Sydney Harbour, New South Wales to the Kimberely in Western Australia, New Guinea and nearby islands as far west as Sulawesi and offshore islands as far south east as Sudest (AKA Tagula Island), north-east as the Solomon Islands and including the Bismark Archipelago as well as Manus Island. Found also in Ambon, Ceram, Buru, Obi, Halmahera, Aru, Kar Kar and other islands near New Guinea. Introduced to Guam where it is a serious ecological pest. Has been found in Micronesia where it may also be introduced.

The various susbspecies are defined and diagnosed below.

***BOIGA IRREGULARIS IRREGULARIS* (BECHSTEIN, 1802).**

Holotype: Lost. Neotype described above.

Diagnosis: *Boiga irregularis irregularis* (Bechstein, 1802) from Eastern Australia, which includes *B. boydii* (Macleay, 1884), that has been synonymised herein is diagnosed and separated from all other subspecies by the following unique suite of characters: It is (in life) (in adults) reddish brown dorsally, with indistinct black speckling along the mid-dorsal line and to a lesser extent the sides. There is no obvious banding pattern and the tail lacks any obvious bands or pattern, being one colour and with just a

few indistinct flecks. There is little black pigment on the head save for scattered darkish blotches and rarely darker etching of the rear of one or two of the last two labials. The belly is a distinctive salmon colour.

Boiga irregularis fusca (Gray, 1842), from Northern Australia west of Cape York and with a type locality of Port Essington, Northern Territory is herein treated as including *B. ornata* (Macleay, 1888), with a type locality of Kings Sound, north-western Australia.

The subspecies *B. irregularis fusca* as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in adults) a distinctive dorsal pattern of alternating thick white and reddish cross-bands of roughly equal width. These bands continue along the tail and the darker bands become considerably wider, at the expense of the whitish ones as one moves towards the end of the tail. All specimens have the reddish bands narrow slightly on the lower flanks, but this is more distinctive in the NT specimens (conforming to *B. fusca*), whereas West Australian animals (which would otherwise be treated as *B. ornata*) have only sight narrowing of the darker bands on the lower flanks. The West Australian animals also tend to have reddish-orange bands as opposed to orange in the Northern Territory and Queensland animals and a stronger contrast between the white and darker bands, but in view of the likely continuum of the populations across the north-west of the NT and nearby WA including throughout the Victoria River region, I do not herein treat them as subspecifically distinct from one another.

Boiga irregularis laticeps (Macleay, 1877) from south-east New Guinea, which includes *B. fravigastra* (Macleay, 1877), that has been synonymised herein, is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in life) (in adults) a distinct blackish-brown temporal streak and similar thick dark etching of the rear upper labials. The top of the head is generally unmarked except for scattered and indistinct peppering. The snout, upper labials and chinshields are creamish to white. Belly is creamish white and the body is generally unpatterned, but with scattered dark flecks. The tail has indistinct blackish and brownish bands.

Boiga irregularis flavescens (Duméril *et al.* 1854) from Sulawesi as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in life) (in adults) a thick dark brown temporal streak running from the lower eye to the back of the head. It does not extend anterior to the eye. There is no dark pigment on the anterior of the head and no obvious dark etching or barring of the upper labials. Dorsally the colour is reddish brown with darkish bands running in a jagged manner across the back. At the mid-dorsal line, these darken to become nearly black and fade to merge with the lighter background on the lower flanks. On the main part of the body, the lighter cross bands are twice as wide as the darker ones. There are no black spots, flecks or markings anywhere on the sides or flanks of the snake, or if so (in some specimens only), they are only continuation of those from the mid-dorsal ridge and do not go beyond the mid flanks. The tail has distinct thick black bands, separated by lighter reddish brown bands of half the thickness. Venter is yellowish brown and immaculate.

Boiga irregularis halmaheraensis subsp. nov. as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in life) (in adults) a thick dark brown temporal streak running from the lower eye to the back of the head and in that it extends anterior to the eye to the nostril, although it is a thinner and less distinct streak anterior to the eye. Colouration in the anterior part of the body is a distinctive combination of bands being beige and yellow in colour.

The interstitial skin in the middle of the beige scales is black, significantly altering the appearance to give the impression of the snake's colouration at forebody being a three coloured series of bands. The mid and lower body is essentially a light beigish-brown colour all over and with scattered black tipped scales giving the snake a flecked appearance. The tail is yellowish brown with black peppering.

Boiga irregularis roddai subsp. nov. from North New Guinea, Manus Island, other nearby islands and accidentally introduced onto the island of Guam is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life, it is characterised by a distinctively light orangeish colouration throughout and a general lack of dark patches or pigment on the head. The body is effectively unpatterned, being an orangeish colour, sometimes broken with a small number of dark flecks. These are scattered dark patches within individual scales, usually not consisting of the whole scale, parts of which remain the orange background colour (usually the outer parts of each scale).

The tail is plain orange with no flecks, banding or other markings. Sometimes the rear upper labials have a dark orange etching. The venter is an immaculate yellowish brown, although in some specimens the edges of each scale are a thickened yellow.

Boiga irregularis buruensis subsp. nov. is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life, other than peppering of scales on the head near the eye (see below), there is no obvious black pigment on the upper body (readily separating this taxon from *B. irregularis irregularis* and *sudestensis subsp. nov*.). The body is an indistinct pattern of dark grey patches on a yellowish-brown background. On the head, there is peppering on the scales running in a line laterally through the eye and near to the eye (both front and back of it) (not seen in *B. irregularis irregularis* and *sudestensis subsp. nov*.).

B. irregularis irregularis lacks obvious temporal markings and *B. sudestensis subsp. nov*. has a distinct but faint temporal streak, but no darkening in front of the eye.

In *Boiga irregularis buruensis subsp. nov*. there is no distinct temporal streak running behind the eye as seen in some of the other subspecies described herein. Other than the grayish peppering near the eye (both front and back of it only) and a large patch of dark grey around the frontal shield (which may fade in old specimens), the rest of the head is distinctly yellow, including the upper labials and the lower labials and chin, giving this taxon a similar appearance to *B. irregularis sudestensis subsp. nov*. as described herein.

Boiga irregularis sudestensis subsp. nov. as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life, it is similar in most respects to *B. irregularis irregularis* as defined above, from which it is separated by having distinct yellowing of the upper labials and rear of the skull and an immaculate yellow belly and distinct but faint temporal streak running behind the eye. There is also less black pigment on the body than on Australian specimens of *B. irregularis irregularis.*

Boiga irregularis solomonensis subsp. nov. is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults (in life), the dorsal pattern is a combination of broken black dorsal cross-bands alternating with thinner brownish-yellow bands. On the sides of the ventrals, these reverse with there being a black rectangular blotch on every second scale, or sometimes every third scale, and the in between ones being immaculate yellowish-white.

The venter itself is also an immaculate yellowish-white. This gives the appearance of two broken black lines running down either side of the belly.

The head is characterized by a dark temporal streak on either side and thick dark lines running across the labials at the rear of the eye, running from the lip upwards, either to or very near the dark temporal streak. The top of the head is often covered with

darker pigment and at least always includes blackish spots or markings on the parietals. The tail is either darkish black or banded.

Boiga irregularis newbritainensis subsp. nov. is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life it is generally orange in dorsal colour with well-defined but indistinct crossbands of similar colour.

There is a general lack of black pigment throughout. The chin shields and lower labials are mainly white, or occasionally some or more may be yellowish. The iris is slightly bluish in colour in contrast to all other subspecies.

The fore-belly is yellow, posterior belly whitish and all is peppered. The posterior rims of each ventral is darkened, being generally greyish on the neck, then yellowish anteriorly and reddish posteriorly.

There is a general lack of white on the upper head (including the upper labials), this being in contrast to most other subspecies which have a very noticeable whitening of the upper labials. There is a slight, but noticeable dark orange etching of the rear upper labials.

Distribution: East of Cape York Australia, from the tip of Cape York to the North Shore of Sydney, New South Wales.

***BOIGA IRREGULARIS FUSCA* (GRAY, 1842).**

Holotype: A specimen at the Museum of Natural History, London, UK, specimen number: 1946.1.1.28 from Port Essington, Northern Territory, Australia.

Diagnosis: *Boiga irregularis fusca* (Gray, 1842), from Northern Australia west of Cape York and with a type locality of Port Essington, Northern Territory is herein treated as including *B. ornata* (Macleay, 1888), with a type locality of Kings Sound, north-western Australia.

The subspecies as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in adults) a distinctive dorsal pattern of alternating thick white and reddish cross-bands of roughly equal width. These bands continue along the tail and the darker bands become considerably longer (at the expense of the whitish ones as one moves towards the end of the tail. All specimens have the reddish bands narrow slightly on the lower flanks, but this is more distinctive in the NT specimens (conforming to *B. fusca*), whereas West Australian animals (which would otherwise be treated as *B. ornata*) have only sight narrowing of the darker bands on the lower flanks. The West Australian animals also tend to have reddish-orange bands as opposed to orange in the NT animals and a stronger contrast between the white and darker bands, but in view of the likely continuum of the populations across the north-west of the NT and nearby WA, I do not herein treat them as subspecifically distinct from one another.

Distribution: Northern Australia from west of Cape York, on the Gulf of Carpentaria, Queensland, across the tropical rim of northern Australia, through the Northern Territory into the north-west of Australia, in the Kimberley division.

***BOIGA IRREGULARIS LATICEPS* (MACLEAY, 1877).**

Syntypes: Specimens at the Australian Museum, Sydney, NSW, Australia, specimen numbers: R3188, 3189, 3190 and 3191 from Hall Sound, Papua New Guinea.

Diagnosis: *Boiga irregularis laticeps* (Macleay, 1877) from south-east New Guinea, which includes *B. fravigastra* (Macleay, 1877), that has been synonymised herein is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in life) (in adults) a distinct blackish-brown temporal streak and similar thick dark etching of the rear upper labials; the top of the head is generally unmarked except for scattered and indistinct peppering. The snout, upper labials and chinshields are creamish to white. Belly is creamish white and the body is generally unpatterned, but with scattered dark flecks. The tail has indistinct blackish and brownish bands.

Distribution: Southern New Guinea in a region east of the Fly River basin.

***BOIGA IRREGULARIS FLAVESCENS* (DUMÉRIL, BIBRON AND DUMÉRIL, 1854).**

Type locality: Sulawesi, Indonesia.

Diagnosis: *Boiga irregularis flavescens* (Duméril *et al.* 1854) from Sulawesi as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in life) (in adults) a thick dark brown temporal streak running from the lower eye to the back of the head. It does not extend anterior to the eye. There is no dark pigment on the anterior of the head and no obvious dark etching or barring of the upper labials. Dorsally the colour is reddish brown with darkish bands running in a jagged manner across the back (being very strong in juveniles). At the mid-dorsal line, these darken to become nearly black and fade to merge with the lighter background on the lower flanks. On the main part of the body, the lighter cross bands are twice as wide as the darker ones. There are no black spots, flecks or markings anywhere on the sides or flanks of the snake, or if so (in some specimens only), they are only continuation of those from the mid-dorsal ridge and do not go beyond the mid flanks. The tail has distinct thick black bands, separated by lighter reddish brown bands of half the thickness. Venter is yellowish brown and immaculate.

Distribution: Sulawesi (Indonesia) and immediately adjacent islands.

BOIGA IRREGULARIS HALMAHERAENSIS SUBSP. NOV.

Holotype: A specimen at the US National Museum (USNM), now called the Smithsonian National Museum of Natural History, Washington, DC, USA, specimen number: 215938.6335071 collected at Kampung Loleba, Wasile District, Moluccas, Indonesia.

This is a facility that allows access to its holdings.

Paratypes: Three specimens at the US National Museum (USNM), now called the Smithsonian National Museum of Natural History, Washington, DC, USA, specimen numbers: 215937.6335070, 215939.6335072 and 215945.6335078 collected at Kampung Loleba, Wasile District, Moluccas, Indonesia.

Diagnosis: *Boiga irregularis halmaheraensis subsp. nov*. as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in life) (in adults) a thick dark brown temporal streak running from the lower eye to the back of the head and in that it extends anterior to the eye to the nostril, although it is a thinner and less distinct streak anterior to the eye. Colouration in the anterior part of the body is a distinctive combination of bands being beige and yellow in colour. The interstitial skin in the middle of the beige scales is black, significantly altering the appearance to give the impression of the snake's colouration at forebody being a three coloured series of bands. The mid and lower body is essentially a light beigish-brown colour all over and with scattered black tipped scales giving the snake a flecked appearance. The tail is yellowish brown with black peppering.

For separation of all other subspecies see for *Boiga irregularis irregularis* as detailed within this paper.

Distribution: Halmahera Island, Indonesia and immediately adjacent smaller islands.

Etymology: Named in reflection of where the taxon comes from.

BOIGA IRREGULARIS RODDAI SUBSP. NOV.

Holotype: A specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R.130423.001 collected at Polomou DPI Station, Manus Island, Admiralty Islands, Manus District, Papua New Guinea (PNG) Lat. 2°07'S, Long. 147°05'E.

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

Paratype: A specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R.129052 collected at Los Negros Island, Admiralty Islands, Manus District, PNG, Lat. 2°01'S, Long. 147°25'E.

Diagnosis: *Boiga irregularis roddai subsp. nov*. from North New Guinea, Manus Island, other nearby islands and accidentally introduced onto the island of Guam is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life, it is characterised by a distinctively light orangeish colouration throughout and a general lack of dark patches or pigment on the head. The body is effectively unpatterned, being an orangeish colour, sometimes broken with a very small number of dark flecks. These are scattered dark patches within individual scales, usually not consisting of the whole scale, parts of which remain the orange background colour (usually the outer parts of each scale).

The tail is plain orange with no flecks, banding or other markings. Sometimes the rear upper labials have a dark orange etching. The venter is an immaculate yellowish brown, lightening to whitish at the rear in some specimens. In some specimens the edges of each ventral scale are a thickened yellow.

For separation of all other subspecies see for *Boiga irregularis irregularis* as detailed within this paper.

Distribution: Northern New Guinea, generally west of the Huon Peninsula and north of the central cordillera, as well as islands to the north including Kar Kar, the Admiralty Islands and more recently accidentally introduced to Guam.

Etymology: Named after Gordon Rodda of the United States Geological Service (USGS) in recognition of his work studying the effects of this invasive subspecies of snake.

BOIGA IRREGULARIS BURUENSIS SUBSP. NOV.

Holotype: A specimen at the Staatliches Museum für Naturkunde, Stuttgart, Germanu, (SMNS), specimen number: Herpetologie:2718, collected at Buru Island, Indonesia.

This is a facility that allows access to its holdings.

Diagnosis: *Boiga irregularis buruensis subsp. nov*. is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life, other than peppering of scales on the head near the eye (see below), there is no obvious black pigment on the upper body (readily separating this taxon from *B. irregularis irregularis* and *sudestensis subsp. nov*.). The body is an indistinct pattern of dark grey patches on a yellowish-brown background. On the head, there is peppering on the scales running in a line laterally through the eye and near to the eye (both front and back of it) (not seen in *B. irregularis irregularis* and *sudestensis sp. nov*.).

B. irregularis irregularis lacks obvious temporal markings and *B. sudestensis subsp. nov.* has a distinct but faint temporal streak, but no darkening in front of the eye.

In *Boiga irregularis buruensis subsp. nov*. there is no distinct temporal streak running behind the eye as seen in some of the other subspecies described herein. Other than the grayish peppering near the eye (both front and back of it only and distinct for this subspecies) and a large patch of dark grey around the frontal shield (which may fade in old specimens), the rest of the head is distinctly yellow, including the upper labials and the lower labials and chin, giving this taxon a similar appearance to *B. irregularis sudestensis sp. nov.* as described herein.

Boiga irregularis sudestensis subsp. nov. as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life, it is similar in most respects to *B. irregularis irregularis* as defined above, from which it is separated by having distinct yellowing of the upper labials and rear of the skull and an immaculate yellow belly and distinct but faint temporal streak running behind the eye. There is also less black pigment on the body than on Australian specimens of *B. irregularis irregularis.*

For separation of all other subspecies see for *Boiga irregularis irregularis* as detailed within this paper.

Distribution: Buru Island as well as Ambon, Ceram and Obi, Indonesia.

Etymology: Named after the location the holotype originates.

BOIGA IRREGULARIS SUDESTENSIS SUBSP. NOV.

Holotype: A specimen at the Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA, specimen number: BPBM 20790 collected at Mt. Rio, oxbow along Gesirava River upstream from "Camp 1", "Point 9" , Sudest Island. Lat. -11°49', Longitude 153°42', Milne Bay Province, Papua New Guinea. The Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA is a facility that allows access to its holdings.

Diagnosis: *Boiga irregularis sudestensis subsp. nov*. as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life, it is similar in most respects to *B. irregularis irregularis* as defined above, from which it is separated by having distinct yellowing of the upper labials and rear of the skull and an immaculate yellow belly and distinct but faint temporal streak running behind the eye. There is also less black pigment on the body than on Australian specimens of *B. irregularis irregularis.*

Boiga irregularis irregularis (Bechstein, 1802) from Eastern Australia, which includes *B. boydii* (Macleay, 1884), that has been synonymised herein is diagnosed and separated from all other subspecies by the following unique suite of characters: It is (in life) (in adults) reddish brown dorsally, with indistinct black speckling along the mid-dorsal line and to a lesser extent the sides. There is no obvious banding pattern and the tail lacks any obvious bands or pattern, being one colour and with just a few indistinct flecks. There is little black pigment on the head save for scattered darkish blotches and rarely darker etching of the rear of one or two of the last two labials. The belly is a distinctive salmon colour.

Boiga irregularis fusca (Gray, 1842), from Northern Australia west of Cape York and with a type locality of Port Essington, Northern Territory is herein treated as including *B. ornata* (Macleay, 1888), with a type locality of Kings Sound, north-western Australia.

The subspecies as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in adults) a distinctive dorsal pattern of alternating thick white and reddish cross-bands of roughly equal width. These bands continue along the tail and the darker bands become considerably longer (at the expense of the whitish ones as one moves towards the end of the tail. All specimens have the reddish bands narrow slightly on the lower flanks, but this is more distinctive in the NT specimens (conforming to *B. fusca*), whereas West Australian animals (which would otherwise be treated as *B. ornata*) have only sight narrowing of the darker bands on the lower flanks. The West Australian animals also tend to have reddish-orange bands as opposed to orange in the NT animals and a stronger contrast between the white and darker bands, but in view of the likely continuum of the populations across the north-west of the NT and nearby WA, I do not herein treat them as subspecifically distinct from one another.

For separation of all other subspecies see for *Boiga irregularis irregularis* as detailed within this paper.

Distribution: Sudest (AKA Tagula Island), Milne Bay Province, Papua New Guinea.

Etymology: Named after where the subspecies is known from.

BOIGA IRREGULARIS SOLOMONENSIS SUBSP. NOV.

Holotype: A specimen at the Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA, specimen number: BPBM 18200 collected at Mt. Austen, Guadalcanal Island, Solomon Islands.

The Bernice Pauahi Bishop Museum is a facility that allows access to its holdings.

Paratype: A specimen at the Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA, specimen number: BPBM 3311 collected at Nini Creek, Roroni, Guadalcanal Island, Solomon Islands.

Diagnosis: *Boiga irregularis solomonensis subsp. nov.* is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults (in life), the dorsal pattern is a combination of broken black dorsal cross-bands alternating with thinner brownish-yellow bands. On the sides of the ventrals, these reverse with there being a black rectangular blotch on every second scale, or sometimes every third scale, and the in between ones being immaculate yellowish-white.

The venter itself is also an immaculate yellowish-white. This gives the appearance of two broken black lines running down either side of the belly.

The head is characterized by a dark temporal streak on either side and thick dark lines running across the labials at the rear of the eye, running from the lip upwards, either to or very near the dark temporal streak. The top of the head is often covered with darker pigment and at least always includes blackish spots or markings on the parietals. The tail is either darkish black or banded.

For separation of all other subspecies see for *Boiga irregularis irregularis* as detailed within this paper.

Dsitribution: The Solomon Islands. It should be noted that there is a strong argument to futher split the Solomon Islands populations based on consistent colouration differences between some of the main islands.

Etymology: ***Named after where the subspecies is known from.***

BOIGA IRREGULARIS NEWBRITAINENSIS SUBSP. NOV.

Holotype: A specimen at the Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA, specimen number: BPBM 22548 collected 9 km NNW of Marmar, New Britain Island, Papua New Guinea.

The Bernice Pauahi Bishop Museum is a facility that allows access to its holdings.

Paratypes: 1/ A specimen at the Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA, specimen number: BPBM 22549 collected 9 km NNW of Marmar, New Britain Island, Papua New Guinea.

2/ A specimen at the Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA, specimen number: BPBM 22550 collected 9.2 km NNW of Marmar, New Britain Island, Papua New Guinea.

3/ A specimen at the Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA, specimen number: BPBM 22551 collected 2.5 km NNW of Marmar, New Britain Island, Papua New Guinea.

Diagnosis: *Boiga irregularis newbritainensis subsp. nov.* is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life it is generally orange in dorsal colour with well-defined but indistinct crossbands of similar colour.

There is a general lack of black pigment throughout. The chin shields and lower labials are mainly white, or occasionally some or more may be yellowish. The iris is slightly bluish in colour in contrast to all other subspecies.

The fore-belly is yellow, posterior belly whitish and all is peppered. The posterior rims of each ventral is darkened, being generally greyish on the neck, then yellowish anteriorly and reddish posteriorly.

There is a general lack of white on the upper head (including the upper labials), this being in contrast to most other subspecies which have a very noticeable whitening of the upper labials. There is a slight, but noticeable dark orange etching of the rear upper labials.

For separation of all other subspecies see for *Boiga irregularis irregularis* as detailed within this paper.

Distribution: New Britain and immediately adjacent islands in the Bismark Archipelago.

Etymology: Named after the location the holotype originated from.

NOTES ON THE DESCRIPTIONS FOR ANY POTENTIAL REVISORS

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

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CONFLICT OF INTEREST

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

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Montivipera xanthina divided and a new subgenus of Eurasian Vipers for the *Vipera raddei* Boettger, 1890 species group (Squamata: Serpentes: Viperidae).

RAYMOND T. HOSER

488 Park Road, Park Orchards, Victoria, 3134, Australia.
***Phone*: +61 3 9812 3322 *Fax*: 9812 3355 *E-mail*: snakeman (at) snakeman.com.au**
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ABSTRACT

Numerous species of European viper snake (Squamata: Serpentes: Viperidae) have been described in recent years. This includes most recently five new species in the *V. latastei* Bosca, 1878, complex by Hoser, (2015). Included were three new species from Europe and two more from northern Africa.

Continuing the formal division of putative viper species on the basis of morphology, distribution and genetics, this paper divides the putative species *Montivipera xanthina* Gray, 1849 as currently recognized into three easily defined species with one being further subdivided into two subspecies.

As no names are available for these taxa, all are named in this paper according to the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999) for the first time.

The need to formally recognize these species is urgent noting the environmental degradation going on where these snakes occur, potentially threatening populations, underpinned by the political instability in the relevant countries. This includes existential threats to governments and ruling elites, which means that wildlife conservation will probably not be a main priority of governments and most resident citizens for the foreseeable future.

Also the so-called *Vipera raddei* Boettger, 1890 species group is herein placed in a new subgenus *Apexvipera subgen. nov.*.

This is in recognition of the group's morphological differences and deep divergence from the other species within the genus *Montivipera* Nilson *et al*. 1999, which is where they are currently placed.

Keywords: Taxonomy; Snakes; Vipers, Europe, Asia, Turkey, Greece, *Montivipera*; *xanthina*; new subgenus; *Apexvipera*; new species; *snakebustersorum*; *yeomansi*; new subspecies; *europa*.

INTRODUCTION

Numerous species of European viper snake (Squamata: Serpentes: Viperidae) have been described in recent years, including most recently, five new species in the *V. latastei* Bosca, 1878, complex by Hoser, (2015). This included three new species from Europe and two more from northern Africa.

In that case, the basis of the division of one putative species into eight was divergent lineages easily identified on both morphological differences and allopatric distributions.

Each population was centred on one or more geographically disjunct areas of hilly habitat.

Two of the newly identified species had available names and as already mentioned, five others were named fore the first time, resulting in eight named species for that complex.

Continuing the formal division of putative viper species on the basis of morphology, distribution and genetics, I looked at other putative viper species from across Eurasia and found several species to be composite.

The audit included a review of specimens and relevant literature.

However invariably there were available names for the divergent or different forms not widely recognized as new or widely known as "named" taxa and so no other papers have been published so far.

Exceptional to that was the south-eastern group known as the *Montivipera xanthina*, Gray, 1849 species complex. *Sensu lato* this species complex, includes several taxa from south-east Europe and the Middle East, most, if not all being treated as synonymous with *M. xanthina* at one time or other.

These are the putative species *M. albizona* Nilson, Andrén and Flärdh, 1990, *M. bulgardaghica* Nilson and Andrén, 1985, *M. wagneri* Nilson and Andrén, 1984, *M. bornmuelleri* Werner, 1898 and *M. xanthina* Gray, 1849.

All these listed species appeared to be valid on the basis of morphological divergence and allopatric distributions.
I should also mention that these snakes have been treated as being within the genus *Montivipera* Nilson *et al.* (1999) since that date, but were variously placed in *Vipera* Laurenti, 1768 or *Daboia* Gray, 1842.
Another species complex associated with *M. xanthina* and also

placed in the genus *Montivipera* is the so-called *M. raddei* Boettger, 1890 species group. Included herein are putative taxa as follows: *M. latifi* Mertens, Darevsky and Klemmer, 1967, *M. raddei* Boettger, 1890 and the putative subspecies *M. raddei kurdistanica* Nilson and Andrén, 1986, *M. raddei albicornuta* Nilson and Andrén, 1985 and *M. raddei kuhrangica* Rajabizadeh, Nilson and Kami, 2011.

None of the putative subspecies of *M. raddei* just listed appear to be terribly divergent from the nominate form to the extent that any should be recognized as full species as indicated by Rastegar-Pouyani *et al.* (2014) although Stümpel *et al.* (2016) showed that the putative species *M. latifi* was the most divergent of the described forms and so has been retained as a species-level taxon for the purposes of this paper.

In terms of the two species groups, namely the *M. xanthina* and *M. raddei* groups, specimens from various geographical areas and ranges were generally divergent from one another, but generally conformed with the named species-level taxa.

However exceptional to that were the snakes still grouped within the putative species, *Montivipera xanthina*, Gray, 1849. These conformed to a series of at least four distinct and allopatric colour variations that appear to be sufficiently divergent on the basis of morphology to be treated as full species.

This paper was originally written dividing all four groups into full species, however in light of the molecular results of a paper by Stümpel *et al.* (2016) that appeared as this paper was about to go to press, one of these has been conservatively downgraded to a subspecies of another based on an alleged divergence of 2 million years for two relevant populations.

Hence this paper divides the putative species *Montivipera xanthina*, Gray, 1849 as currently recognized into three easily defined species with one being further subdivided into two subspecies.

As no names are available for these taxa, all are named in this paper according to the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999) for the first time.

As mentioned in the abstract, the need to formally recognize these species is urgent noting the environmental degradation going on where these snakes occur, potentially threatening populations, underpinned by the political instability in the relevant countries. This includes existential threats to governments and ruling elites, which means that wildlife conservation will probably not be a main priority of governments and most of the resident citizens for the foreseeable future.

The so-called *M. raddei* species group was also deemed to be sufficiently divergent from the so-called *M. xanthina* complex as listed before to warrant being treated as a separate genus-level grouping. Stümpel *et al.* (2016) gave a 12.5 MYA divergence between the two groups and so this paper conservatively treats the *M. raddei* species group as a subgenus which is formally named for the first time as *Apexvipera subgen. nov.*.

I note that if these were mammals, there would be no hesitation for taxonomists to elevate the subgenus *Apexvipera subgen. nov.* to full genus status. This elevation may be done by later herpetologists in any event.

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

This is in view of the conservation significance attached to the formal recognition of unnamed species and on the basis that further delays may in fact put these otherwise unnamed taxa at greater risk of extinction should their status in the wild unexpectedly change.

In July 2016, a military coup overthrew the elected government of Turkey. While the coup was itself overturned within hours, the sequence of events underpinned the political instability in the country (Akyol 2016).

By mid 2016, Greece was similarly unstable with three major bailouts of the government by other countries in the Eurozone and the prospect of a second vote to decide whether or not to leave the European Union (Smith 2016).

These situations confirm that the relevant viper species described within this paper are not likely to get any support from the governments of either country and so it is my intention that by offering them formal taxonomic recognition that people outside these countries may be able to assist in conserving the relevant taxa.

To underline the seriousness of the conservation threats to the relevant species, I note the relevant comments of Ettling *et al.* (2013), who wrote in their abstract: “Armenian vipers (*Montivipera raddei*) have a restricted and fragmented distribution throughout portions of Armenia, eastern Turkey, and northwestern Iran. Over the past 40 years their population numbers have dropped by nearly 88% due to a combination of over-collection for the pet trade, conversion of habitat to agriculture and overgrazing by livestock.”

Published literature relevant to *Montivipera xanthina* and associated species, including the so-called *M. raddei* species group and the taxonomic judgements within this paper include the following: Arakelyan *et al.* (2011), Arýkan *et al.* (2004, 2008), Bettex (1993), Bodson (2009), Boettger (1880, 1890), Boulenger (1896), Clark (2000), David and Ineich (1999), Edelman and Frank (2007), Engelmann *et al.* (1993), Ettling *et al.* (2012, 2013), Franzen and Sigg (1989), Garrigues *et al.* (2005), Gaulke (2008), Glandt *et al.* (1998), Gray (1849), Herrmann *et al.* (1999), Hoser (2013, 2015), Joger and Meder (1997), Kasapidis *et al.* (1996), Kumlutas *et al.* (2004), Kwet (2010), Kwet and Trapp (2014a, 2014b), Lenk *et al.* (2001), Leviton *et al.* (1992), Mallow *et al.* (2003), McDiarmid *et al.* (1999), Mebert *et al.* (2016), Mertens (1952), Mertens *et al.* (1967), Nilson and Andren (1985, 1986), Nilson *et al.* (1988, 1989, 1990), Phelps (2010), Pyron *et al.* (2013), Radspieler and Schweiger (1990), Rajabizadeh *et al.* (2011, 2015), Rastegar-Pouyani *et al.* (2014), Sanz *et al.* (2008), Schätti and Baran (1988), Schätti *et al.* (1991), Schlüter (2009, 2010), Schmidt and Kunz (2005), Schmidtler *et al.* (1990), Schneider (1983), Schweiger (2009), Schwarz (1936), Shine and Madsen (2004), Sigg (1987a, 1987b), Sindaco *et al.* (2000, 2006), Strauch (1869), Stümpel and Trapp (2006), Stümpel *et al.* (2016), Tiedemann and Grillitsch (1986), Trapp (2007, 2014), Trutnau (1975), Venchi and Sindaco (2006), Werning and Wolf (2007), Wirth (2014a, 2014b) and sources cited therein.

NOTES ON THE DESCRIPTIONS FOR ANY POTENTIAL REVISERS

Unless mandated by the rules of the *International Code of Zoological Nomenclature*, none of the spellings of the newly proposed names should be altered in any way. Should one or more newly named taxa be merged by later authors to be treated as a single genus or species, the order of prority of retention of names should be the order as listed in the keywords part of the abstract.

MONTIVIPERA SNAKEBUSTERSORUM SP. NOV.

Holotype: A preserved specimen at the California Academy of Science, California, USA, (CAS), specimen number: CAS HERP 135748, collected from Sultan Daglari, Aksehir, Turkey.

The California Academy of Science, California, USA allows access to its holdings.

Diagnosis: The three species of snake until now treated as *M. xanthina* Gray, 1849 can be readily separated from one another on the basis of consistent differences in dorsal colouration.

M. snakebustersorum sp. nov. is separated from all other species by having a dorsal colour of dark, blackish blotches over a whitish background, running along the dorsal midline, these merging along the body to form a configuration of a thickened tightened s-shaped marking along the lower neck or anterior part of the body. Anteriorly and posteriorly these blotches or large

spots tend to separate from one another, being surrounded by the whitish background.

M. xanthina Gray, 1849 as defined herein is separated from the other two species by having a similar patterning to *M. snakebustersorum sp. nov.* but with the blotches being orangeish-brown in colour and merging to become a distinctive mid-dorsal zig-zag along the anterior part of the body. The edges of the dorsal blotches or zig-zag have an obvious blackening, being slightly more prominent on the head and neck.

M. yeomansi sp. nov.. is separated from the other species by one or other of: 1/ A dorsal pattern similar to *M. snakebustersorum sp. nov.* but with the large dorsal blotches along the forebody not merging to become a thickened tightened s-shaped marking along the lower neck or anterior part of the body. Instead at this part of the body, the blotches become large squarish blobs, that while usually separated by lighter whitish pigment, may occasionally touch one another at a small part of the border (subspecies *M. yeomansi yeomansi subsp. nov.*), or: 2/ A dorsal pattern consisting of greyish blotches, rather than blackish or brownish, merging on the neck to form s-shaped curves running along the dorsal midline on the neck and a line of interconnected irregular-shaped greyish blotches running along the forebody (subspecies *M. yeomansi europa subsp. nov.*).

The subgenus *Apexvipera subgen. nov*. are separated from the nominate subgenus *Montivipera* Nilson *et al.* 1999 by having a complete circumocular ring of scales. By contrast in *Montivipera* this ring is divided by the supraocular.

Vipers in the genus *Montivipera* are separated from other true viper genera by the following unique suite of characters: Supraocular shield large, erectile, the free border angular, separated from the eye by a series of small scales; nostril in a single nasal, which is partially fused with the naso-rostral; 23 mid-body rows; 150-180 ventrals.

Snakes in the tribe Viperini, as defined by Hoser (2013), which includes *Montivipera*, are separated from all other true vipers by the following suite of characters: pupil is elliptical, adults of the snakes are generally small (subtribes *Viperina* and *Montiviperina*) to medium or large (subtribe Maxhoserviperina) and more or less stoutly built. The head is distinct from the neck, of triangular shape, and covered with small scales in many species, although some have a few small plates on top. The dorsal scales are strongly keeled, the anal plate is divided, as are the subcaudals. Importantly this group are defined by the characteristic zig-zag pattern or similar running down their back, more-or-less along the dorsal midbody line, this pattern sometimes becoming a series of blotches or spots running longitudinally along the body (as in the genus *Daboia*). All are viviparous (live bearing). They are distributed in Eurasia and adjacent parts of North Africa.
The subgenus *Apexvipera subgen. nov*. are further defined and separated from other viper species by the following suite of characters: Snout rounded; vertical diameter of eye measuring hardly half its distance from the mouth. Rostral somewhat deeper than broad, not extending to the upper surface of the snout; head covered above with small feebly keeled scales; supraocular well developed, erectile, the free edge angular, separated from the eye by small scales, the eye being surrounded by a complete circle of 14 to 17 small scales (separating the subgenus from the other subgenus *Montivipera*); eye separated from the labials by two series of scales; nostril pierced in a single nasal, which is imperfectly separated from the naso-rostral; temporal scales keeled; 9 or 10 upper labials. 23 mid-body rows that are strongly keeled. 150-180 ventrals; anal entire; 23-32 subcaudals. Pale brown or greyish above, with a dorsal series of somewhat lighter reddish roundish spots which are dark-edged on the sides; these spots may be in pairs and alternating; sides with two series of dark brown spots; a dark / \ - shaped marking on the back of the head and a dark streak behind the eye; yellowish beneath, powdered with black, each scale with a transverse series of black and white spots (derived from Boulenger 1896).

Distribution: Western Toros Daglari (generally west of Göksu Nehri) and hills immediately north (Sultan Daglari) in Turkey.

Etymology: Named in honour of the hard working team at Snakebusters: Australia's best reptiles shows, for more than a decades work including the core activity of wildlife displays and education in schools, events and for "Reptile Parties" a concept first pioneerted by myself and associates more than 30 years ago and now being copied globally. The staff have also assisted in fieldwork in various places, accessing museum specimens on my behalf when travelling to relevant cities, and other logistical assistance in the research and conservation of various species. Included among those people honoured by the patronym "snakebustersorum" are the following: Ateaka Campbell, Tom Cotton, Scott Eipper, Judy Fergusson, Adelyn Hoser, Jacky Hoser, Shireen Hoser, Michael Laidlaw, Andrew Lamont, Louise McGoldrick, Simon McGoldrick, Dylan Mullins, Dara Nin, Andrew Paget, Demi Perkins, Christopher Pillot, James Proudly, Fred Rossignolli, Callum Sharples; Michael Smyth, Christopher Trioano, Judy Whybrow, Peter Whybrow, Andrew Wilson, all of Victoria, Australia at the relevant times they have been with the Snakebusters team engaged in core activities.
Numerous other individuals who have worked with Snakebusters to a lesser extent or provided invaluable assistance's to the team are not named herein but should be treated as honoured by the patronym name.

MONTIVIPERA YEOMANSI SP. NOV.

Holotype: A preserved specimen at the Carnegie Museum of Natural History, (CM Herps Collection), Pittsburgh, Pennsylvania, USA, specimen number: CM Herps 69429 collected from Bornova, Izmir, Turkey. The Carnegie Museum of Natural History allows access to its holdings.

Paratypes: A preserved specimen at the Naturalis Biodiversity Center, Leiden, The Netherlands, specimen registration number: RMNH.RENA.31984, collected from Selcuk, South Izmir, Turkey, and:

Four preserved specimens at the Centennial Museum, University of Texas at El Paso in El Paso, Texas, USA, specimen numbers: H-16368, H-16369, H-16370 and H-16372 collected from Karyagdi Hill, Oke, Turkey.

Diagnosis: The three species of snake until now treated as *M. xanthina* Gray, 1849 can be readily separated from one another on the basis of consistent differences in dorsal colouration.

M. snakebustersorum sp. nov. (formally described above) is separated from all other species by having a dorsal colour of dark, blackish blotches over a whitish background, running along the dorsal midline, these merging along the body to form a configuration of a thickened tightened s-shaped marking along the lower neck or anterior part of the body. Anteriorly and posteriorly these blotches or large spots tend to separate from one another, being surrounded by the whitish background.

M. xanthina Gray, 1849 as defined herein is separated from the other two species by having a similar patterning to *M. snakebustersorum sp. nov.* but with the blotches being orangeish-brown in colour and merging to become a distinctive mid-dorsal zig-zag along the anterior part of the body. The edges of the dorsal blotches or zig-zag have an obvious blackening, being slightly more prominent on the head and neck.

M. yeomansi sp. nov.. is separated from the other species by one or other of: 1/ A dorsal pattern similar to *M. snakebustersorum sp. nov.* but with the large dorsal blotches along the forebody not merging to become a thickened tightened s-shaped marking along the lower neck or anterior part of the body. Instead at this part of the body, the mid-dorsal blotches become large squarish blobs, that while usually separated by lighter whitish pigment, may occasionally touch one another at a small part of the border (subspecies *M. yeomansi yeomansi subsp. nov.*), or: 2/ A dorsal pattern consisting of greyish blotches, rather than blackish or brownish, merging on the neck

to form s-shaped curves running along the dorsal midline on the neck and a line of interconnected irregular-shaped greyish blotches running along the forebody (subspecies *M. yeomansi europa subsp. nov.*).

The subgenus *Apexvipera subgen. nov*. are separated from the nominate subgenus *Montivipera* Nilson *et al*. 1999 by having a complete circumocular ring of scales. By contrast in *Montivipera* this ring is divided by the supraocular.

Vipers in the genus *Montivipera* are separated from other true viper genera by the following unique suite of characters: Supraocular shield large, erectile, the free border angular, separated from the eye by a series of small scales; nostril in a single nasal, which is partially fused with the naso-rostral; 23 mid-body rows; 150-180 ventrals.

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generally small (subtribes *Viperina* and *Montiviperina*) to medium or large (subtribe Maxhoserviperina) and more or less stoutly built. The head is distinct from the neck, of triangular shape, and covered with small scales in many species, although some have a few small plates on top. The dorsal scales are strongly keeled, the anal plate is divided, as are the subcaudals. Importantly this group are defined by the characteristic zig-zag pattern or similar running down their back, more-or-less along the dorsal midbody line, this pattern sometimes becoming a series of blotches or spots running longitudinally along the body (as in the genus *Daboia*). All are viviparous (live bearing). They are distributed in Eurasia and adjacent parts of North Africa. The subgenus *Apexvipera subgen. nov.* are further defined and separated from other viper species by the following suite of characters: Snout rounded; vertical diameter of eye measuring hardly half its distance from the mouth. Rostral somewhat deeper than broad, not extending to the upper surface of the snout; head covered above with small feebly keeled scales; supraocular well developed, erectile, the free edge angular, separated from the eye by small scales, the eye being surrounded by a complete circle of 14 to 17 small scales (separating the subgenus from the other subgenus *Montivipera*); eye separated from the labials by two series of scales; nostril pierced in a single nasal, which is imperfectly separated from the naso-rostral; temporal scales keeled; 9 or 10 upper labials. 23 mid-body rows that are strongly keeled. 150-180 ventrals; anal entire; 23-32 subcaudals. Pale brown or greyish above, with a dorsal series of somewhat lighter reddish roundish spots which are dark-edged on the sides; these spots may be in pairs and alternating; sides with two series of dark brown spots; a dark / \ - shaped marking on the back of the head and a dark streak behind the eye; yellowish beneath, powdered with black, each scale with a transverse series of black and white spots (derived from Boulenger 1896).

Distribution: Western Turkey, immediately adjacent to the Aegean Sea and nearby Greece and Greek Islands with a distribution centred on hilly outliers of the main central Turkey ranges. The subspecies *M. yeomansi europa subsp. nov.* appears to be confined to eastern Greece and a small number of Greek islands in the northern Aegean Sea.

Etymology: Named in honour of Luke Yeomans, a well-known British Herpetologist, who died prematurely from a King Cobra bite at his UK facility on 29 June 2011.

His contributions to herpetology are numerous and include his pioneering work in breeding the Irian Jaya Dwarf Mulga Snake (*Pailsus rossignollii*) in the decade following my formal description of the taxa in 2000 (Hoser 2000). The results of his breedings appeared in a book about keeping and breeding Australasian elapid snakes by Scott Eipper (Eipper, 2012).

Besides being an extremely passionate and skilled herpetologist, Yeomans was also a wonderful human being who never lost sight of the beauty of the reptiles he loved so dearly.

However it is the things that went wrong during his life that should be highlighted as a warning to other potential herpetologists in future generations.

Yeomans first came to my attention in the early 1990's after he was prosecuted for the allegedly heinous crime of feeding live food to a reptile.

For this mortal sin, he was dragged through Britain's criminal courts, prosecuted, convicted and fined. Then he was held up for public hatred in Britain's notorious tabloid media.

The legal precedent now sits as a threat and if need be, a means to criminally charge any other reptile keeper who dares use live food for any reptiles, including such humble items as mealworms or crickets and then upsets anyone in a government authority.

Yeomans said he was originally "dobbed in" by another reptile person, the notorious Mark O'Shea, whom he said had an axe to grind against him. The relevant authority in this case, the RSPCA in the UK,

ran the prosecution.

I wrote about the case in the book "*Smuggled: The Underground Trade In Australia's Wildlife*", (Hoser, 1993) published in May 1993, and unexpectedly shortly thereafter met Yeomans in person at the Orlando Reptile Expo in the United States in August 1993.

That was when the League of Florida Herpetological Societies invited me there to give a talk about Australia's own draconian wildlife law enforcement.

As inferred already, it was the personality of Yeomans that impressed me rather than his herpetological skills, noting that in Orlando, I didn't get to see Yeomans working with reptiles!

My next contact with Yeomans was in the period postdating my description of the Irian Jaya Dwarf Mulga Snake (*Pailsus rossignollii*) in 2000 and him wanting to breed them in captivity. Ultimately he did this.

Beyond that, the next conversations related to the issue of safety for himself in his own reptile shows that he intended doing at a "King Cobra Sanctuary" that he was planning to open in the UK in mid 2011.

In this, I specifically mean the use of venomoid snakes as described by Hoser (2004).

These are snakes that have had their venom glands surgically removed in a virtually painless operation and where the snakes get to keep their fangs and are as far as they are concerned "normal".

By 2010, Yeomans had seen how in the previous 6 years myself and ten staff had done over 10,000 venomous snake shows with the world's five deadliest snakes and without any fatal or near fatal snakebites.

He had seen videos of myself taking bites from the snakes to prove they were safe and was well aware of the benefits of the venomoid snakes, not just for the safety aspect, but also the welfare of the snakes.

In fact Yeomans himself had previously owned a venomoid cobra!

Yeomans toyed with the idea of making all his large King Cobras venomoid because he feared that sooner or later he'd make a handling error and get bitten. However he decided against doing so and the reason for this is important.

He had no issues with the surgery and the false claims of cruelty to the snakes. In fact in terms of the venomoid snakes, there was no sensible reason for him not to get them except for one.

That reason was the expected attacks he would get from Mark O'Shea, a man he described as his sworn enemy, and Wolfgang Wüster, both loitering within the reptile fraternity and both of the UK and both of whom had been key sponsors of an anti-Hoser and antivenomoid petition website, run by a convicted wildlife

smuggler, David John Williams and his close friend Shane Hunter in Australia (Hunter 2006).
The petition called for the Australian government to shut down the Hoser business at gunpoint, which ultimately happened on 17 August 2011 and took four years of intense legal wrangling to get the illegal government actions overturned by the highest court in the Australian state of Victoria (Court of Appeal Victoria 2014, VCAT 2015).

Yeomans was in extreme fear that should O'Shea or Wüster become aware of him having venomoid snakes, that they would attack and undermine his reptile display business and worse still have him targeted by the RSPCA or some other powerful government-backed authority again.

With one "animal cruelty" conviction already, Yeomans decided the likelihood of attacks and another more serious conviction would terminally disable his business, including by landing him in jail for a lengthy term of imprisonment and so he decided instead to take the risk of keeping his snakes that he handled for shows "hot".

Besides the phone calls we had, Yeomans also sent numerous e-mails complaining about the reckless conduct of Mark O'Shea and his friend Wolfgang Wüster in terms of himself, even detailing how O'Shea had improperly had him expelled from the UK-based "International Herpetological Society".

Yeomans made countless comments about O'Shea in particular, whom he described as being a cross between a rat and a dog.

He said O'Shea was physically like a rat, as in small, bony and hairy and like a Shitzu dog in that he constantly "yapped", "shits you" and never shuts up.

I could devote several pages to the adverse comments made by Yeomans about O'Shea, Wüster and their unethical behaviour, but these are not particularly relevant beyond what has already been told in terms of how they made Yeomans choose not to protect himself with venomoid Cobras.

On 29 June 2011, Yeomans made the snake handling error that cost him his life.

Just days before his "King Cobra Sanctuary" was due to open to much fanfare, one of his "hot" snakes bit him and he died.

At just 47 years of age a herpetologist in the prime of his career was killed.

If Luke Yeomans had not been forced by these other self-styled "herpetologists" to put his life at unnecessary risk with snakes that could easily have been devenomized, he would still be breeding rare and endangered reptiles and educating people at his new "King Cobra Sanctuary".

Much has been made in recent years of the threats to private individuals and their rights to be allowed to keep and study reptiles. The alleged threat is often identified as coming from outside the herpetological community. The usual bogeyman identified are militant animal rights groups and the like.

They are not the real enemy and never have been.

These people lack expertise in reptiles and do not carry any political or legal power in terms of reptiles and the law. Put simply, no one takes them seriously and they are not the people who come to court to give false and bogus "expert" evidence against (fellow) herpetologists. By contrast the real enemy

is within the reptile community and those self-appointed "experts" who use this position to harass and attack others doing public good. The reckless conduct of O'Shea and Wüster, both holotype examples of self-appointed "experts" and "spokesmen" for herpetology (which they are not) were in effect directly responsible for the premature death of Yeomans.
Put simply, O'Shea and Wüster are directly culpable for the death of Yeomans and the grief it caused to his friends, family and others, as well as the damage caused to the wildlife conservation cause.
Here in Australia, in 2011 through to 2015, my family, my business, my friends and staff have been subjected to numerous illegal armed raids, criminal charges and the like designed to destroy the Snakebusters business and wreck the conservation gains we had achieved over the previous decade.

While the raids, criminal charges and the like were conducted by (in this case) very corrupt government wildlife officers under the control of the corrupt and hateful Glenn Sharp of the Victorian Government Wildlife Department (DSE), the whole series of actions were in fact initiated by people within the

reptile fraternity. In our case the main enemy was a group of newly established "reptile businesses", which included former employees of the government run zoo, part of the same department that regulates us, but for whom Wüster and O'Shea both provided their own brand of "expert evidence" in a court in 2015. Fortunately the allegations of Wüster and O'Shea were rejected by the presiding judge as unscientific claims poisoned by envy (VCAT 2015).

Because the other businesses and the government's own zoo business couldn't match the standards of Snakebusters, they simply used their powers to unlawfully close us down!

While we eventually won the legal battles, the cost in terms of time and money caused irreparable damage to myself, my family, the rest of the Snakebusters team and the wider wildlife conservation and research cause.

By naming a Eurasian snake species after Luke Yeomans, it is hoped that people who look into the etymology of the name, familiarize themselves with the story of his totally avoidable and premature death and see who are the culpable people. These being those who not only made his life at times unbearable in life, but also effectively brought it to a premature and abrupt end.

It's hoped that people realise that the enemies of herpetology are more likely to be within the reptile community rather than outside.

MONTIVIPERA YEOMANSI EUROPA SUBSP. NOV.

Holotype: A preserved specimen at the Naturalis Biodiversity Cente, Leiden, The Netherlands, specimen registration number: RMNH.RENA.23595, collected at Loutros, Greece. This facility allows access to its holdings.

Diagnosis: The three species of snake until now treated as *M. xanthina* Gray, 1849 can be readily separated from one another on the basis of consistent differences in dorsal colouration.

M. snakebustersorum sp. nov. is separated from all other species by having a dorsal colour of dark, blackish blotches over a whitish background, running along the dorsal midline, these merging along the body to form a configuration of a thickened tightened s-shaped marking along the lower neck or anterior part of the body. Anteriorly and posteriorly these blotches or large spots tend to separate from one another, being surrounded by the whitish background.

M. xanthina Gray, 1849 as defined herein is separated from the other two species by having a similar patterning to *M. snakebustersorum sp. nov.* but with the blotches being orangeish-brown in colour and merging to become a distinctive mid-dorsal zig-zag along the anterior part of the body. The edges of the dorsal blotches or zig-zag have an obvious blackening, being slightly more prominent on the head and neck.

M. yeomansi sp. nov.. is separated from the other species by one or other of: 1/ A dorsal pattern similar to *M. snakebustersorum sp. nov.* (described above) but with the large dorsal blotches along the forebody not merging to become a thickened tightened s-shaped marking along the lower neck or anterior part of the body. Instead at this part of the body, the blotches become large squarish blobs, that while usually separated by lighter whitish pigment, may occasionally touch one another at a small part of the border (subspecies *M. yeomansi yeomansi subsp. nov.*), or: 2/ A dorsal pattern consisting of greyish blotches, rather than blackish or brownish, merging on the neck to form s-shaped curves running along the dorsal midline on the neck and a line of interconnected irregular-

shaped greyish blotches running along the forebody (subspecies *M. yeomansi europa subsp. nov.*).

The subgenus *Apexvipera subgen. nov*. are separated from the nominate subgenus *Montivipera* Nilson *et al.* 1999 by having a complete circumocular ring of scales. By contrast in *Montivipera* this ring is divided by the supraocular.

Vipers in the genus *Montivipera* are separated from other true viper genera by the following unique suite of characters: Supraocular shield large, erectile, the free border angular, separated from the eye by a series of small scales; nostril in a single nasal, which is partially fused with the naso-rostral; 23 mid-body rows; 150-180 ventrals.

Snakes in the tribe Viperini, as defined by Hoser (2013), which includes *Montivipera*, are separated from all other true vipers by the following suite of characters: pupil is elliptical, adults of the snakes are generally small (subtribes *Viperina* and *Montiviperina*) to medium or large (subtribe Maxhoserviperina) and more or less stoutly built. The head is distinct from the neck, of triangular shape, and covered with small scales in many species, although some have a few small plates on top. The dorsal scales are strongly keeled, the anal plate is divided, as are the subcaudals. Importantly this group are defined by the characteristic zig-zag pattern or similar running down their back, more-or-less along the dorsal midbody line, this pattern sometimes becoming a series of blotches or spots running longitudinally along the body (as in the genus *Daboia*). All are viviparous (live bearing). They are distributed in Eurasia and adjacent parts of North Africa.
The subgenus *Apexvipera subgen. nov.* are further defined and separated from other viper species by the following suite of characters: Snout rounded; vertical diameter of eye measuring hardly half its distance from the mouth. Rostral somewhat deeper than broad, not extending to the upper surface of the snout; head covered above with small feebly keeled scales; supraocular well developed, erectile, the free edge angular, separated from the eye by small scales, the eye being surrounded by a complete circle of 14 to 17 small scales (separating the subgenus from the other subgenus *Montivipera*); eye separated from the labials by two series of scales; nostril pierced in a single nasal, which is imperfectly separated from the naso-rostral; temporal scales keeled; 9 or 10 upper labials. 23 mid-body rows that are strongly keeled. 150-180 ventrals; anal entire; 23-32 subcaudals. Pale brown or greyish above, with a dorsal series of somewhat lighter reddish roundish spots which are dark-edged on the sides; these spots may be in pairs and alternating; sides with two series of dark brown spots; a dark / \ - shaped marking on the back of the head and a dark streak behind the eye; yellowish beneath, powdered with black, each scale with a transverse series of black and white spots (derived from Boulenger 1896).

Distribution: This subspecies is confined to far south-east Greece, near the border of Turkey and a few immediately adjacent Greek Islands. As far as is known, both subspecies are allopatric.

Etymology: Named in reflection that it is a European viper species. The suffix should not be changed to “ensis” unless mandated by the *International Code of Zoological Nomenclature.*

MONTIVIPERA YEOMANSI YEOMANSI SUBSP. NOV.

Holotype: A preserved specimen at the Carnegie Museum of Natural History, (CM Herps Collection), Pittsburgh, Pennsylvania, USA, specimen number: CM Herps 69429 collected from Bornova, Izmir, Turkey. The Carnegie Museum of Natural History allows access to its holdings.

Paratypes: A preserved specimen at the Naturalis Biodiversity Center, Leiden, The Netherlands, specimen registration number: RMNH.RENA.31984, collected from Selcuk, South Izmir, Turkey, and:

Four preserved specimens at the Centennial Museum, University of Texas at El Paso in El Paso, Texas, USA, specimen numbers: H-16368, H-16369, H-16370 and H-16372 collected from Karyagdi Hill, Oke, Turkey.

Diagnosis: See the diagnosis for *M. yeomansi europa subsp. nov*. within this paper for a formal diagnosis of this subspecies as well.

Distribution: Western Turkey, immediately adjacent to the Aegean Sea and nearby Greece and Greek Islands with a distribution centred on hilly outliers of the main central Turkey ranges. The subspecies *M. yeomansi europa subsp. nov.* appears to be confined to eastern Greece and a small number of Greek islands in the northern Aegean Sea, with the subspecies *M. yeomansi yeomansi subsp.* nov. found elsewhere in this range. As far as is known, both subspecies are allopatric.

APEXVIPERA SUBGEN. NOV.

Type species: *Vipera raddei* Boettger, 1890.

Diagnosis: The subgenus *Apexvipera subgen. nov*. are separated from the nominate subgenus *Montivipera* Nilson *et al.* 1999 by having a complete circumocular ring of scales. By contrast in the subgenus *Montivipera* this ring is divided by the supraocular.

Vipers in the genus *Montivipera* are separated from other true viper genera by the following unique suite of characters: Supraocular shield large, erectile, the free border angular, separated from the eye by a series of small scales; nostril in a single nasal, which is partially fused with the naso-rostral; 23 mid-body rows; 150-180 ventrals.

Snakes in the tribe Viperini, as defined by Hoser (2013), which includes *Montivipera*, are separated from all other true vipers by the following suite of characters: pupil is elliptical, adults of the snakes are generally small (subtribes *Viperina* and *Montiviperina*) to medium or large (subtribe Maxhoserviperina) and more or less stoutly built. The head is distinct from the neck, of triangular shape, and covered with small scales in many species, although some have a few small plates on top. The dorsal scales are strongly keeled, the anal plate is divided, as are the subcaudals. Importantly this group are defined by the characteristic zig-zag pattern or similar running down their back, more-or-less along the dorsal midbody line, this pattern sometimes becoming a series of blotches or spots running longitudinally along the body (as in the genus *Daboia*). All are viviparous (live bearing). They are distributed in Eurasia and adjacent parts of North Africa.
The subgenus *Apexvipera subgen. nov.* are further defined and separated from other viper species by the following suite of characters: Snout rounded; vertical diameter of eye measuring hardly half its distance from the mouth. Rostral somewhat deeper than broad, not extending to the upper surface of the snout; head covered above with small feebly keeled scales; supraocular well developed, erectile, the free edge angular, separated from the eye by small scales, the eye being surrounded by a complete circle of 14 to 17 small scales (separating the subgenus from the other subgenus *Montivipera*); eye separated from the labials by two series of scales; nostril pierced in a single nasal, which is imperfectly separated from the naso-rostral; temporal scales keeled; 9 or 10 upper labials. 23 mid-body rows that are strongly keeled. 150-180 ventrals; anal entire; 23-32 subcaudals. Pale brown or greyish above, with a dorsal series of somewhat lighter reddish roundish spots which are dark-edged on the sides; these spots may be in pairs and alternating; sides with two series of dark brown spots; a dark / \ - shaped marking on the back of the head and a dark streak behind the eye; yellowish beneath, powdered with black, each scale with a transverse series of black and white spots (derived from Boulenger 1896).

Distribution: Iran, Turkey, Azerbaijan and Armenia.

Etymology: Named in reflection of them being the “top” (as in most sought after) viper snakes by many enthusiasts and hobbyist collectors in Europe, coupled with the word “vipera”, as these snakes are vipers.

Content: *Montivipera* (*Apexvipera*) *raddei* (Boettger, 1890) (type species); *M.* (*Apexvipera*) *latifi* Mertens, Darevsky and Klemmer, 1967. However in terms of the putative taxon *M.* (*Apexvipera*) *latifi* one should note that its status as a full species has been questioned by the evidence of Rastegar-Pouyani *et al.* (2014). The subgenus *Montivipera* Nilson *et al.* 1999 defined by the above diagnosis, except for the reversal of relevant characters as indicated, includes all other species in the genus *Montivipera*, these being *M. albizona* Nilson, Andrén and Flärdh, 1990, *M. bornmuelleri* Werner, 1898, *M. bulgardaghica* Nilson and Andrén, 1985, *M. snakebustersorum sp. nov.*, *M. wagneri* Nilson and Andrén, 1984, *M. xanthina* Gray, 1849 and *M. yeomansi sp. nov.*.

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CONFLICT OF INTEREST

The author has no known relevant conflicts of interest.

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A long overdue taxonomic rearrangement of the Uromastycinae (Squamata: Sauria: Agamidae), … correcting a repeated inadvertent typographical error and ensuring the nomenclatural availability of the new name *Euanedwardssaurus* as well as the correct names or spellings for a tribe of Blindsnakes, a Python and a Kukri snake.

RAYMOND T. HOSER

488 Park Road, Park Orchards, Victoria, 3134, Australia.
***Phone*: +61 3 9812 3322 *Fax*: 9812 3355 *E-mail*: snakeman (at) snakeman.com.au**
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ABSTRACT

Hoser (2014b) provided a revised taxonomy Uromastycinae Theobold, 1868.

One of the newly proposed generic names *Euanedwardssaurus* (correctly with this spelling in the abstract) was mistyped in later parts of the paper as *Edwardssaurus*, leading to potential confusion by readers and a potential view of homonymy with the earlier name *Edwardssaurus* Hoser, 2013, (Hoser, 2013) which identifies a different genus (type species *Platysaurus torquatus* Peters, 1879) and clearly has priority.

So that there can be no confusion as to the availability of the name *Euanedwardssaurus* for the relevant taxa, this paper redescribes the relevant genus as new herein with the correct spelling throughout in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride *et al*. 1999).

This paper does however treat the Hoser (2014b) description of *Euanedwardssaurus* Hoser, 2014 as correct for that name and asks others to do so.

If one were not to accept that name as validly published in the earlier paper, the relevant genus described herein as new would be relegated to subgenus status within *Dallysaurus* Hoser, 2014 (being elevated to full genus status), as opposed to being the other way around as originally intended.

However, to do this act (treat the original use of the name *Euanedwardssaurus* as incorrect) would be a clear breach of both the original author's stated intentions (herein) and the rules of the *International Code of Zoological Nomenclature* as cited by Hoser (2014b).

The relevant literature is cited by Hoser (2014b) and Hoser (2013).

Hoser (2012b) inadvertently misspelt the genus name *Argyrophis* Gray, 1845, as *Argyophis* and this error transposed to the naming of the tribe it was within. To correct the error the tribe for the genus is described herein as "new" as Argyrophiini *tribe nov.*.

The name *Broghammerus reticulatus mandella* Hoser, 2014 from Halmahera, should not have its spelling changed.

The subgenus *Geddykukrius* Hoser, 2012, within the genus *Smythkukri* Hoser, 2012 should not have its spelling altered even though the person whom the snake was named after had his name spelt differently.

Keywords: Taxonomy; Lizards; Blindsnakes; Middle-east; Asia; Africa; Uromastycinae; *Uromastyx*; Uromastyxiini; *Newmansaurus*; *Dallysaurus*; *Edwardssaurus*; Argyrophis; new genus; *Euanedwardssaurus*; new subgenus; *Euanedwardssaurus*.

INTRODUCTION

Hoser (2014b) provided a revised taxonomy for the Uromastycinae Theobold, 1868.

One of the newly proposed generic names *Euanedwardssaurus* (correctly identified thus in the abstract) was mistyped in later parts of the paper as *Edwardssaurus*, leading to potential confusion by readers and a potential view of homonymy with the earlier name *Edwardssaurus* Hoser, 2013, (Hoser, 2013) (p. 22) which identifies a different genus (type species *Platysaurus torquatus* Peters, 1879) and clearly has priority.

So that there can be no confusion as to the availability of the name *Euanedwardssaurus* for the relevant Uromastycinae taxa as identified in the 2014 paper published on 30 August 2014 and to ensure stability of nomenclature in accordance with the *International Code of Zoological Nomenclature* (Ride *et al*. 1999), this paper redescribes the relevant genus as new herein with the correct spelling throughout in accordance with the rules of the *International Code of Zoological Nomenclature* so that the name is available and from 2014.

This paper does however treat the Hoser (2014b) description of *Euanedwardssaurus* Hoser, 2014 as correct for that name and asks others to do so.

If one were not to accept that name as validly published in the earlier paper, the relevant genus described herein as new would be relegated to subgenus status within *Dallysaurus* Hoser, 2014, as opposed to being the other way around as originally intended.

However, to do this act (treat the original use of the name *Euanedwardssaurus* as incorrect) would be a clear breach of both the original author's stated intentions (herein) and the rules of the *International Code of Zoological Nomenclature* as cited by Hoser (2014b).

It should be noted that I also assert all rights as "first reviser" in accordance with the rules of the Code to establish *Euanedwardssaurus* as the correct generic name for the type species *Uromastyx dispar* Heyden, 1827.

The relevant literature is cited by Hoser (2014b) and Hoser (2013).

Hoser (2012b) in a major monograph on the world's Blindsnakes inadvertently misspelt the genus name *Argyrophis* Gray, 1845, as *Argyophis* and this error transposed to the naming of the tribe it was within. To correct the error the tribe for the genus is described herein as "new" as Argyrophiini *tribe nov.*.
Hoser (2014a) described the taxon *Broghammerus reticulatus mandella* Hoser, 2014 from Halmahera, the trinomial patronym being based on Nelson Rolihlahla Mandela who was a South African anti-apartheid revolutionary, politician, and philanthropist, who served as President of South Africa from 1994 to 1999, but by misspelling his name, this carried over to the trinomial name. Notwithstanding this error of spelling, as both original author and first reviser, I have decided that the spelling should remain as is, this being "*mandella*".

In the paper Hoser (2012a), a subgenus was formally proposed, namely *Geddykukrius* Hoser, 2012, within the genus *Smythkukri* Hoser, 2012, being named in honour of an Andrew Gedye, myself misspelling his name in the paper and therefore also the subgenus name.

Notwithstanding this, as both original author and first reviser, I hereby declare that the subgenus *Geddykukrius* Hoser, 2012, within the genus *Smythkukri* Hoser, 2012 should not have its spelling altered even though the person whom the snake was named after had his name spelt differently.

GENUS *EUANEDWARDSSAURUS GEN. NOV.*

Type species: *Uromastyx dispar* Heyden, 1827.

Diagnosis: The genus *Euanedwardssaurus gen. nov.* is best defined by separation of each of the described subgenera.

Therefore each diagnosis given herein separates not just the subgenus from others within the genus, but also from all other Uromastyxiini *tribe nov*. species.

Euanedwardssaurus gen. nov. are defined by one of the following three suites of characters:

1/ Has preanofemoral pores; the tail is long being 48-75% of SVL, from above the tail has an elongated appearance; the last 2-5 tail whorls are formed of continuous scales rows; 138-227 scales at midbody; 68-112 ventrals between gular and inguinal fold; tail with 16-21 whorls (subgenus *Euanedwardssaurus subgen. nov.*), or:

2/ Has preanofemoral pores; the tail is long being 48-103% of SVL, viewed from above it appears to be elongated; the last 12-21 tail whorls formed of continuous scale rows; anterior margin of ear opening without enlarged scales (subgenus *Newmansaurus subgen. nov.*), or:

3/ Lacks preanofemoral pores; the tail is long being 71-94% of SVL; 22-27 tail whorls; body scales larger, approx. 143-227 scales at midbody; 66-100 scales between gular and inguinal fold (subgenus *Dallysaurus subgen. nov.*).

The lizard subfamily *Uromastycinae* Theobold, 1868 is most easily defined as follows:

Acrodont dentition, with the premaxillary bone forming in adult specimens a sharp, tooth-like structure replacing the incisive teeth. Tail scalation is arranged in distinct whorls.

For the tribe Uromastyxiini Hoser, 2014 these whorls are not separated by intercalary scales dorsally.

For the tribe Borgsauriini Hoser, 2014 these whorls are separated by 1-6 rows of intercalary scales dorsally.

In further detail the subfamily Uromastycinae is defined as follows:
Tympanum large, vertically elliptic and distinct. Incisors large, uniting in the adult into one or two cutting-teeth, separated from the molars by a toothless interspace. Body depressed, without a crest. No gular pouch; a transverse gular fold. Tail short, depressed, covered with whorls of large spinose scales. Praeanal and femoral pores present.

The head is small, feebly depressed, with a short snout and obtuse canthus rostralis; nostril large, directed backwards, nearer the end of the snout than the eye; upper head-scales smooth, much larger than those on the body, smallest on supraorbital region; occipital not enlarged; labials small and numerous. Neck strongly plicate. Limbs short and thick; hind limb with spinose conical tubercles; digits short and armed with strong claws. Scales on the upper surface of the body very small, on belly larger, fiat, smooth, juxtaposed or subimbricate.

Distribution: Northern Africa, including those countries that abut and include the Sahara Desert as well as the immediately nearby Middle East and lower Arabian Peninsula.

Etymology: Named in honour of Euan Edwards, currently of the Gold Coast, Queensland, Australia, for his immense contributions to herpetology world-wide, including considerable behind the scenes logistical support for herpetologists and scientists in several countries (including myself), including extensive fieldwork in Australia, the United States of America, Madagascar and Africa and gaining access to various institutions, collections, diagnostic facilities and the like, spanning some decades. Also of note is that it was in August 1993, when in Florida, USA that I was with Euan Edwards when he first showed me live specimens of "*Uromastyx*" from the genus now named in his honour that were on view at the 1993 Orlando Reptile Expo.

Content: *Euanedwardssaurus dispar* (Heyden, 1827) (type species); *E. acanthinura* (Bell, 1825); *E. benti* (Anderson, 1894); *E. flavifasciata* (Mertens, 1962); *E. hodhensis* (Trape *et al.*, 2012); *E. maliensis* (Joger and Lambert, 1996); *E. nigriventris* (Rothschild and Hartert, 1912); *E. ocellata* (Lichenstein, 1823); *E. shobraki* (Wilms and Schmitz, 2007); *E. yemenensis* (Wilms and Schmitz, 2007).

SUBGENUS *EUANEDWARDSSAURUS SUBGEN. NOV.*

Type species: *Uromastyx dispar* Heyden, 1827.

Diagnosis: The subgenus *Euanedwardssaurus subgen. nov.* is defined by the following suite of characters:

Has preanofemoral pores; the tail is long being 48-75% of SVL, from above the tail has an elongated appearance; the last 2-5 tail whorls are formed of continuous scales rows; 138-227 scales at midbody; 68-112 ventrals between gular and inguinal fold; tail with 16-21 whorls (subgenus *Euanedwardssaurus subgen. nov.*).

The other two subgenera within *Euanedwardssaurus gen. nov.* are defined as follows: one or other of:

1/ Has preanofemoral pores; the tail is long being 48-103% of SVL, viewed from above it appears to be elongated; the last 12-21 tail whorls formed of continuous scale rows; anterior margin of ear opening without enlarged scales (subgenus *Newmansaurus subgen. nov.*), or:

2/ Lacks preanofemoral pores; the tail is long being 71-94% of SVL; 22-27 tail whorls; body scales larger, approx. 143-227 scales at midbody; 66-100 scales between gular and inguinal fold (subgenus *Dallysaurus subgen. nov.*).

Distribution: North Africa.

Etymology: See for genus *Euanedwardssaurus gen. nov.*.

Content: *Euanedwardssaurus* (*Euanedwardssaurus*) *dispar* (Heyden, 1827) (type species); *E.* (*Euanedwardssaurus*) *acanthinura* (Bell, 1825); *E.* (*Euanedwardssaurus*) *flavifasciata* (Mertens, 1962); *E.* (*Euanedwardssaurus*) *hodhensis* (Trape *et al*., 2012); *E.* (*Euanedwardssaurus*) *maliensis* (Joger and Lambert, 1996); *E.* (*Euanedwardssaurus*) *nigriventris* (Rothschild and Hartert, 1912).

SUBGENUS *DALLYSAURUS SUBGEN. NOV.*

Type species: *Aporoscelis benti* Anderson, 1894.

Diagnosis: The subgenus *Dallysaurus subgen. nov.* is defined by the following suite of characters:

Lacks preanofemoral pores; the tail is long being 71-94% of SVL; 22-27 tail whorls; body scales larger, approx. 143-227 scales at midbody; 66-100 scales between gular and inguinal fold (subgenus *Dallysaurus subgen. nov.*).

The other two subgenera within *Euanedwardssaurus gen. nov.* are defined as follows: one or other of:

1/ Has preanofemoral pores; the tail is long being 48-75% of SVL, from above the tail has an elongated appearance; the last 2-5 tail whorls are formed of continuous scales rows; 138-227 scales at midbody; 68-112 ventrals between gular and inguinal fold; tail with 16-21 whorls (subgenus *Euanedwardssaurus subgen. nov.*).

2/ Has preanofemoral pores; the tail is long being 48-103% of SVL, viewed from above it appears to be elongated; the last 12-21 tail whorls formed of continuous scale rows; anterior margin of ear opening without enlarged scales (subgenus *Newmansaurus subgen. nov.*).

Distribution: The southern Arabian Peninsula.

Etymology: Named in honour of Gavin Dally, in 2014 the long-serving collection manager at the Natural Sciences Museum and Art Gallery of the Northern Territory, Darwin, NT, for his many services to zoology.

Content: *Euanedwardssaurus* (*Dallysaurus*) *benti* (Anderson, 1894) (type species); *E.* (*Dallysaurus*) *shobraki* (Wilms and Schmitz, 2007); *E.* (*Dallysaurus*) *yemenensis* (Wilms and Schmitz, 2007).

SUBGENUS *NEWMANSAURUS SUBGEN. NOV.*

Type species: *Uromastyx ocellata* Lichtenstein, 1823.

Diagnosis: The subgenus *Newmansaurus subgen. nov.* is defined by the following suite of characters:

Has preanofemoral pores; the tail is long being 48-103% of SVL, viewed from above it appears to be elongated; the last 12-21 tail whorls formed of continuous scale rows; anterior margin of ear opening without enlarged scales (subgenus *Newmansaurus subgen. nov.*).

The other two subgenera within *Euanedwardssaurus gen. nov.* are defined as follows: one or other of:

1/ Has preanofemoral pores; the tail is long being 48-75% of SVL, from above the tail has an elongated appearance; the last 2-5 tail whorls are formed of continuous scales rows; 138-227 scales at midbody; 68-112 ventrals between gular and inguinal fold; tail with 16-21 whorls (subgenus *Euanedwardssaurus subgen. nov.*).

2/ Lacks preanofemoral pores; the tail is long being 71-94% of SVL; 22-27 tail whorls; body scales larger, approx. 143-227 scales at midbody; 66-100 scales between gular and inguinal fold (subgenus *Dallysaurus subgen. nov.*).

Distribution: North-east Africa, including North-west Somalia, Djibouti, Eritrea, Northern Sudan, South East Egypt, Ethiopia (near the Somalian border).

Etymology: Named in honour of Chris Newman of the UK, Chairman of the Federation of British Herpetologists in recognition of his lobbying for rights of private reptile keepers.

Content: *Euanedwardssaurus (Newmansaurus) ocellata* (Lichtenstein, 1823) (monotypic).

TRIBE ARGYROPHIINI *TRIBE NOV.*

(Terminal taxon: *Typhlops diardii* Schlegel, 1839)

Diagnosis: This tribe is monotypic for the genus *Argyrophis* Gray, 1845. The diagnosis for the tribe is therefore the same as for the genus. It is separated from all other Blindsnakes by the following characteristics: Snout rounded and strongly projecting. Nostrils lateral. Rostral is narrow, its upper portion about one third the width of the head, extending to between the eyes; nasal nearly completely divided, the cleft proceeding from the second labial; a praeocular nearly as large as the ocular in contact with the second and third labials; eyes distinct; praefrontal and frontal usually scarcely larger the scales on the body; supraoculars and parietals broader; four upper labials. Diameter of the body is 29-34 times in the total length; tail is as long as broad, or broader than long, terminating in a spine. These are the only Typhlopids outside of Africa known to retain a left lung.

Distribution: India, across south-east Asia east to island New Guinea. Most specimens are reported in the literature as the species *diardii*, but based on obvious and published morphological differences, several species are involved and some have been formally described, including those listed within Hoser (2012b).

Content: *Argyrophis* Gray, 1845.

SUMMARY

1/ The generic name *Euanedwardssaurus* has now been properly published for a genus of Lizards, by one or other of:

A/ via correction of a typographical error in the original paper by the same author,

B/ via a correction made by a first reviser or;

C/ By republication in this paper as “new”, with the intended name published correctly throughout and in the one date year.

2/ The correct tribe name Argyrophiini *tribe nov.* has been formally published herein making the name nomenclaturally available.

3/ The trinomial in the name *Broghammerus reticulatus mandella* Hoser, 2014 should not be altered in any way by later authors, even though the person whom the taxon is named after had his name spelt “Mandela”.

4/ The subgenus *Geddykukrius* Hoser, 2012, within the genus *Smythkukri* Hoser, 2012 should not have its spelling altered even though the person whom the snake was named after had his name spelt differently, the correct spelling for his name being “Gedye”.

CONFLICT OF INTEREST

This author reports no relevant conflict of interest.

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Two new subspecies of *Hoplocephalus* Wagler, 1830 from eastern Australia (Serpentes: Elapidae).

RAYMOND T. HOSER

488 Park Road, Park Orchards, Victoria, 3134, Australia.
***Phone*: +61 3 9812 3322 *Fax*: 9812 3355 *E-mail*: snakeman (at) snakeman.com.au**
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ABSTRACT

The East Australian elapid genus *Hoplocephalus* Wagler, 1830 has long been treated by the majority of Australian taxonomists as consisting of three well-defined species as seen in the definitive texts of Cogger 2014, Hoser 1989, Wells and Wellington 1985.

Notwithstanding this, Keogh *et al.* (2003) found sufficient genetic divergences in the two main populations of the species *H. stephensi* Krefft, 1869 to state that "managers should treat the Queensland and NSW populations of *H. stephensi* as separate conservation units".

This paper formalizes that division by naming as a subspecies the unnamed population from south-east Queensland in the region north of the McPherson Range. A second isolated Queensland population from the Kroombit Tops area south-west of Gladstone, an area about 100 km straight line north of the nearest outlier of the more southern population is also named herein as a new subspecies.

Descriptions of both taxa is made in accordance of the provisions of the current edition of the *International Code of Zoological Nomenclature*.

Keywords: Taxonomy; elapid; snake; Australia; New South Wales; Queensland; *Hoplocephalus*; *stephensi*; *bitorquatus*; new subspecies; *andrewgedyei*; *boutrosi*; mtDNA; sequence divergence; geographical barrier; morphological differences.

INTRODUCTION

As part of a study of Australian snakes spanning more than 40 years, the east Australian elapid genus *Hoplocephalus* Wagler, 1830 was scrutinized in detail. In the 1970's I became aware of strong regional differences in populations of both *H. stephensi* Krefft, 1869 and *H. bitorquatus* (Jan, 1859).

For the latter taxon, there appears to be a distinct southern and northern population. The name "*revelata*" De Vis (1911) is available for the otherwise unnamed northern population (Cogger *et al.* 1983).
Stephen's Banded Snakes, *H. stephensi* are a species usually found in wetter forests in hilly areas from the Central Coast of New South Wales to the lower Central Coast of Queensland, in the hills south-west of Gladstone.

Living in Sydney in the 1970's and 1980's I had access to numerous specimens from the Ourimbah area about 80 km north of Sydney CBD. Subspequent to that I had access to numerous live specimens from the Mount Glorious region on the outer edge of Brisbane in Queensland in early 1987.

Noting significant differences in the morphology of the relevant snakes, I had intended at the time considering naming the Queensland animals as a different subspecies, pending further investigations, but was prevented from doing so by several factors. This included uncertainty as to the exact boundary between the relevant populations and whether or not the variation was clinal or clearly defined and separated by geography.

These questions were largely answered by Keogh *et al.* (2003) who found that there were indeed two well defined populations with a mtDNA 1.7% sequence divergence. The geographical barrier between the two groups was shown to be the McPherson Range on the NSW/Queensland border.

Significantly Keogh *et al.* (2003) did not examine specimens with a view to establishing morphological differences between the two forms. Furthermore as part of their analysis they did not investigate the northern outlier population from the Kroombit Tops area south-west of Gladstone in southern-central coastal Queensland.

This population consists of mainly melanistic specimens and all specimens are readily separated from southern individuals.

In fact it appears that at the time they wrote their paper, the authors were unaware of the existence of this population. They wrote: "*Hoplocephalus stephensii* is found along a near-coastal strip from the Newcastle area in central eastern New South Wales to the Gympie area in southern Queensland."

On the basis of the preceding and noting the comments by Keogh *et al.* (2013) that "managers should treat the Queensland and NSW populations of *H. stephensi* as separate conservation units", I have no hesitation in assigning names to each of the relevant populations in accordance with the rules of the current edition of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

Cogger *et al*. (1983) lists the type locality of *H. stephensi* as Port Macquarie, NSW, this being the southern population and now herein regarded as the nominate subspecies. This means each of the Queensland populations are until now unnamed as subspecies.
They are formally described below.

The papers of Keogh *et al*. (2013) and Pyron *et al*. (2013) both indicate that the three species of *Hoplocephalus* are reasonably closely related in terms of their molecular data, indicating that subspecies is the appropriate level for each of the newly described taxa herein.

HOPLOCEPHALUS STEPHENSI BOUTROSI SUBSP. NOV.

Holotype: A preserved specimen in the Queensland Museum, Brisbane, Queensland, specimen number: J49881, collected from about 40 km North West of Brisbane, Queensland.

The specimen had another catalogue number, namely 1948241.

The Queensland Museum, Brisbane, Queensland is a government-owned facility that allows public access to its specimen holdings.

Paratype: A preserved specimen in the Queensland Museum, Brisbane, Queensland, specimen number: J15335, collected from about 10 km north west of Brisbane, Queensland.

The specimen had another catalogue number, namely 1932139.

Diagnosis: *H. stephensi boutrosi subsp. nov*. is separated from the nominate subspecies *H. stephensi stephensi* by having a weakly defined difference between the brown and black scales on the dorsal surface of the head, as opposed to a strongly defined difference between the lighter (but still darkish) brown and the black on the dorsal surface of the head in *H. stephensi stephensi.*

In *H. stephensi boutrosi subsp. nov.* the yellow blotches behind the eye are tending to form striping backwards, albeit broken. This contrasts with *H. stephensi stephensi* which tends not to have these yellow blotches, instead having the yellow on the upper labial/s and brown on the upper temporals in a configuration not seen in *H. stephensi boutrosi subsp. nov.*.
In *H. stephensi boutrosi subsp. nov*. the upper temporals are black, fading to dark brown as one moves to the centre of the back of the head.

The taxon, *Hoplocephalus stephensi andrewgedyei subsp. nov.* formally described below, is readily separated from the other two subspecies (*H. stephensi stephensi* and *H. stephensi boutrosi subsp. nov.*) by the distinct lightish striping on the lower flanks (versus indistinct or absent in other populations). It is further separated from the other two subspecies by having a very thick dark bar running from the lip, up the labials to the eye and immediately underneath it, versus small and or triangular dark blotches running from the lip to the eye in the other two species.
Most, but not all *Hoplocephalus stephensi andrewgedyei subsp. nov.* are unbanded, although this is not in itself diagnostic of the subspecies as unbanded *H. stephensi boutrosi subsp. nov*. and *H. stephensi stephensi* are also known.

A key to separate of the three species of *Hoplocephalus* is provided by Cogger (2014) and good colour photos of the three relevant species are provided in proximity in Hoser (1989).

Distribution: Known from the vicinity of the NSW/Queensland border along the coast and nearby ranges (mainly the hilly areas) north to about Gympie in South-east Queensland. The isolated population known from the vicinity of Kroombit Tops south-west of Gladstone in Queensland, is of the subspecies *Hoplocephalus stephensi andrewgedyei subsp. nov.* where it is found in wet forests.

Etymology: Named in honour of Templestowe, Victoria businessman Steve Boutros for services to the fitness industry, wildlife conservation and upholding the law in Australia.

HOPLOCEPHALUS STEPHENSI ANDREWGEDYEI SUBSP. NOV.

Holotype: A preserved specimen in the Queensland Museum, Brisbane, Queensland, specimen number: J40218, collected from near Kroombit Tops, Queensland.

The specimen had another catalogue number, namely 1952519.

The Queensland Museum, Brisbane, Queensland is a government-owned facility that allows public access to its specimen holdings.

Paratype: A preserved specimen in the Queensland Museum, Brisbane, Queensland, specimen number: J43752, collected from near Kroombit Tops, Queensland. The specimen had another catalogue number, namely 1944126.

Diagnosis: The taxon, *Hoplocephalus stephensi andrewgedyei subsp. nov*. is readily separated from the other two subspecies of *H. stephensi* by the distinct lightish striping on the lower flanks immediately above the venter and along that linear plane (versus indistinct or absent in other populations of the other subspecies). It is further separated from the other two subspecies by having a very thick dark bar running from the lip, up the labials to the eye and immediately underneath it, versus small and or triangular dark blotches running from the lip to the eye in the other two species.
Most, but not all *Hoplocephalus stephensi andrewgedyei subsp. nov*. are unbanded, although this is not in itself diagnostic of the subspecies as unbanded *H. stephensi boutrosi subsp. nov*. and *H. stephensi stephensi* are also known.

A key to separate of the three species of *Hoplocephalus* is provided by Cogger (2014) and good colour photos of the three relevant species are provided in proximity in Hoser (1989).

Distribution: Known only from the vicinity of Kroombit Tops south-west of Gladstone in Queensland, where it is found in wet forests.

Etymology: Named in honour of Andrew Gedye, in recognition of his excellent work with reptiles spanning many decades. His main activity has been in the captive breeding of many rare and potentially threatened species as well as many months of extensive fieldwork in all parts of mainland Australia.

He currently lives in a suburb of Cairns, Queensland, formely living in Cheltenham, Victoria.

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CONFLICT OF INTEREST

The author has no known relevant conflicts of interest.

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A previously unrecognized species of sea snake (Squamata: Serpentes: Elapidae: Hydrophiinae).

RAYMOND T. HOSER

488 Park Road, Park Orchards, Victoria, 3134, Australia.
***Phone*: +61 3 9812 3322 *Fax*: 9812 3355 *E-mail*: snakeman (at) snakeman.com.au**
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ABSTRACT

The sea snakes are perhaps one of the most over-classified groups of snakes in terms of major reviews of their species level and genus level taxonomy that have led to new taxonomic and nomenclatural configurations.

Numerous authors have conducted wide-ranging audits of the genus-level taxonomy of the Hydrophiinae over the last century. The Hydrophiinae includes the majority of marine elapids.

In the post 2000 period, among the quite divergent genus level taxonomies that have been proposed, are major splits as seen in the proposals of Kharin (2004) and Wells (2007).

However, Hoser (2013) and this paper broadly follow the taxonomy of Sanders *et al.* (2012) and Ukuwela *et al.* (2012a, 2012b), who have merged many previously recognized genus groupings based on newly obtained molecular phylogenies.

At the species level, numerous authors have applied names to any potentially different sea snakes in a bid to assert name authority on any potentially unnamed taxon (e.g. Kharin 2004 and earlier works by the same author cited therein).

As a result of this, when more recent studies using advanced techniques (such as molecular methods) to accurately identify cryptic species are concluded, the newly identified species invariably already have available names as coined by earlier authors.

A global audit of the Hydrophiinae by this author found a number of generally unrecognized taxa, that based on any reasonable assessment constituted valid species-level taxa. One example is three species previously lumped within a single "*Enhydrina schistosa* Daudin, 1803" (now *Hydrophis schistosus*).

Most of the unrecognized Hydrophiinae species had available names for them (including the *Enhydrina* species), which will have to be used when the relevant taxa became widely recognized.

However one Hydrophiinae population worthy of taxonomic recognition did not have an available name.

These it is named herein according to the provisions of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

This is a species of *Emydocephalus* Krefft, 1869 from the Western Australia region, until now treated as *Emydocephalus annulatus* Krefft, 1869.

The nominate species is herein confined to eastern Queensland and immediately adjacent areas.

Keywords: Taxonomy; nomenclature; sea snakes, new species; *Emydocephalus; annulatus*; *ijimae*; *szczerbaki*; *teesi; Enhydrina*; *werneri*; *schistosa*; *zweifeli.*

INTRODUCTION

As mentioned in the abstract, the sea snakes are perhaps one of the most over-classified groups of snakes in terms of major reviews of their species level and genus level taxonomy.

Numerous authors have conducted wide-ranging audits of the genus-level taxonomy of the Hydrophiinae being a group which includes the majority of marine elapids. There have been numerous configurations proposed.

Notwithstanding the advent of new molecular methods of analysis and many of the relationships between species being accurately resolved, the taxonomy and nomenclature of the group has remained in heated dispute based on differing interpretations of these same results, by very competent scientists..

In the wake of this, at one extreme has been the erection of new genera and even families to accommodate morphologically divergent forms (Wells 2007).

Ukuwela *et al.* (2012) have taken an opposing position of merging many previously recognized genera, based principally

on relatively recent divergences of the species involved.

In the post 2000 period, quite divergent genus level taxonomies have been proposed, including major splits as seen in the proposals of Kharin (2004) and Wells (2007).

Hoser (2013) and this paper broadly follow that of Sanders *et al.* (2012a, 2012b) and Ukuwela *et al.* (2012).

As of 2015, the backlash against division of larger genera (not the sea snakes I might add) has at times become irrational, even when the molecular evidence supports such splits. One small group of self-appointed so-called herpetologists have even seen fit to step outside the *International Code of Zoological Nomenclature*, sometimes referred to as the "Zoological Code" or "Rules of Zoology", (cited here as Ride *et al.* 1999) and demanded a mass-boycott of valid names (Kaiser 2012a, 2012b, edited slightly to become Kaiser *et al.* 2013).

The claims of Kaiser (2012a, 2012b) and Kaiser *et al.* (2013) were thoroughly discredited by Hoser (2012a).

Seeking consistency of taxonomy and nomenclature, the majority of herpetologists have reclassified the sea snakes in the past decade along phylogenetic lines as per Ukuwela *et al.* (2012a, 2012b). The result is the merging several genera, most notably a broad group consisting most species into the single genus *Hydrophis* Latreille, 1801.

At the species level, numerous authors have applied names to any potentially different sea snakes in a bid to assert name authority on any potentially unnamed taxon (e.g. Kharin 2004 and earlier works by the same author cited therein).

Significantly, Wells (2007) did not apply names to any local variants of wide-ranging species, thereby effectively refuting the claims by Kaiser *et al.* (2013) that he was actively engaging in taxonomic vandalism by placing names on regional populations in examples of evidence-free taxonomy.

However as a result of acts of taxonomic vandalism (involving authors cited below), when more recent studies using better methods (such as molecular methods) to accurately identify cryptic species are concluded, the newly identified species invariably already have available names as coined by earlier authors.

A global audit of the Hydrophiinae by this author found a number of generally unrecognized taxa, that based on any reasonable assessment constituted valid species-level taxa. One example was three species previously lumped within a single "*Enhydrina schistosa* Daudin, 1803" (now *Hydrophis schistosus*).

Most of the unrecognized Hydrophiinae species had available names for them, which will have to be used when the relevant taxa became widely recognized.

However one species level taxon was not named.

It is therefore named herein according to the provisions of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

This is a species of *Emydocephalus* Krefft, 1869 from the Western Australia region, until now treated as *Emydocephalus annulatus* Krefft, 1869.

The nominate species is herein confined to eastern Queensland and immediately adjacent areas.

MATERIALS AND METHODS

The audit of the Hydrophiinae was straight forward, methodical and simple, although very time consuming.

All relevant literature was assessed and specimens of most relevant taxa had been inspected over a 30 year period, in the wild and in institutional collections, including at several Australian Museums.

Recognized species were assessed in the context of potential cryptic species and when they were suspected, tests were applied to see if they did in fact exist.

When found, the new taxa were checked against the literature to see if they had an available name (later made a synonym) which could be applied to the new species based on holotype details.

In most cases this was found to be the case. One exception, as mentioned in the abstract was a species of *Emydocephalus* Krefft, 1869 from the Western Australia region, most closely associated with *Emydocephalus annulatus* Krefft, 1869.

In terms of finding potentially hidden species, reviews were done for each taxon in terms of regional or other morphs, variants, distributional gaps and the like. Publicly available molecular data, as published in papers cited below and available from Genbank was checked to see where unnamed taxa may be identified.

Checks of suspected species were made against other factors such as geographical barriers, including when reconciled with ice-age sea level maxima and minima and the resulting land masses and ocean currents.

When all factors indicated potentially unrecognized or unnamed species, the specimens of each relevant taxon was inspected to see if they displayed obvious species level differences.

This review cannot claim to be the last word on new species within the Hydrophiinae. Not all museum specimens on the planet were examined and any number may be misidentified in one way or other.

Furthermore, and in spite of the large human population in south-east Asia and northern Australia, many areas remain uncollected by scientists and may hold as yet undescribed species.

So-called variation within some wide-ranging species (e.g. *Hydrophis elegans* Gray, 1842) may in fact be more than one currently unrecognized species.

However the formal naming of a new species of Hydrophiinae is significant and should not be delayed indefinitely pending the potential discovery of yet more species.

WHEN AUDITING OTHER PEOPLE'S WORKS FINDS ERRORS OR UNNAMED SPECIES

Rhodin *et al.* (2015), following on from Kaiser *et al.* (2013) have accused me of "data mining" the works of others to find and name new species.

I make no apologies for this.

I find it bizarre that so-called scientists can do excellent scientific work that brings them to the cusp of finding and naming new subspecies, species, subgenera or genera and then failing to do the relatively simple last steps before abandoning their work. These last steps may involve doing things outside the area of expertise of the authors (such as a morphological assessment of the potentially new species, as opposed to number crunching with a BEAST program or similar, as well as a literature audit), but in my view are too often overlooked in the haste to publish, the end result being a defective paper.

Surely if one scientist is unable to logically complete a research project or paper, they could collaborate with another who can!

It is commonly said that one scientist's error is another's thesis and this has been the case in many of the papers I have published.

Often in the recent past new species have been defined and then named on the basis of molecular phylogenies produced between populations. I make no apologies for taking such studies and transposing the results on to other species (as recognized) affected by the same geographical barriers and factors, to determine if other accepted wide-ranging species are in fact composite.

This has enabled me to identify and name dozens of reptile species to date, including to a large extent the one named herein, although I note in this case there is already supporting molecular and morphological data published and publicly available.

Invariably once a candidate un-named species is identified by the factors indicated above, inspection of relevant specimens

always leads to the identification of obvious differences between the nominate and unnamed forms.

Again this is the case in terms of the single species defined for the first time ever within this paper.

Even when there is no "prize" in the form of a new species-level taxon being named for the first time, it is in my view incumbent on authors to do the final legwork in terms of potentially new taxa identified, in order to avoid confusion by later authors and also to save other scientists wasting their time looking for new species in places there are not any species awaiting to be named.

I commonly see in papers, evidence of a new and unnamed species, only to check the literature to find that it does in fact already have an available name, but this significant information is omitted from the paper, either deliberately or due to failure of the authors to look. In most cases if the original authors were to do this simple act of publishing any available names and the fact that there were or were not names available, later scientists would be saved considerable effort.

Also if an unnamed clade, normally worthy of taxonomic identification and naming is identified in a paper and not named, the authors should give a reason for not doing so, if this is in fact what happens.

This is because non-taxonomists who publish on species that may be potentially misidentified have their works significantly devalued once it becomes apparent that either the "wrong" species was the subject of a given paper or data from what was thought to be one species may have included more than one.

In other words, as per the recommendations of the *International Code of Zoological Nomenclature*, newly identified species should be named as soon as possible.

One such example I can refer to is the paper of Ukuwela *et al.* (2012b) (published in hard copy in 2013), which correctly shows that Asian "*Enhydrina schistosa* Daudin, 1803" (now *Hydrophis schistosus*) are of a widely separated lineage to the Australian ones and that the Australian ones should be recognized as a different species.

They also correctly identify consistent differences between the forms to allow people to identify specimens when in the field.

At page 268, they correctly assign Australian specimens to the species *zweifeli* Kharin, 1985. I note that although the original description by Kharin was defective in many ways, it was code compliant and that Ukuwela *et al.* (2012b) correctly used the name.

Significantly, they did not engage in the taxonomic and nomenclatural act of theft as advocated by Kaiser *et al.* (2013) to coin their own name for this species-level taxon.

However, where I take issue with Ukuwela *et al.* (2012b) and herein make it known for the purpose of constructive criticism of their paper so that others may learn from their "mistake" is that the authors failed to properly assess some of the other evidence they obtained.

Their molecular results for the Asian "*Enhydrina schistosa* Daudin, 1803" (now *Hydrophis schistosus*) showed clearly that there were two species-level taxa identified there as well.

Based on their molecular results, the nominate form from Sri Lanka differed significantly by way of divergence, from those from south-east Asia. In fact the differences were greater than between other recognized species (e.g. *Hydrophis coggeri* (Kharin, 1984) and *Hydrophis pacificus* Boulenger, 1896 as shown in the same set of results). Notwithstanding this clear evidence of two species being labelled "*Enhydrina schistosa* Daudin, 1803", the authors did not take the matter further to either confirm the inference or reject it.

This failure to complete this final step to their study led to potential confusion by others who could easily ignore their results and assume both were of the same taxon.

I did an audit of the relevant taxon as identified by Ukuwela *et al.* (2012b) as "*Enhydrina schistosa* Daudin, 1803" and found that there were in fact two species, not one.

I also audited the literature and found an "available name" for the second taxon (the south-east Asian one) and used that name, rather than invoking the so-called "*Kaiser veto"* (Eipper 2013) to coin my own name in breach of the *International Code of Zoological Nomenclature.*

Of course multiple species can only diverge from a common ancestor if there is a barrier of some form and in the case of snakes this is invariably physical.

While there is no apparent physical barrier between those specimens from the Indian subcontinent and south-east Asia at the present time, there clearly was at the time of the Ice-age maxima, where sea levels were estimated at 120 metres lower than present (Molengraaff 1921a, 1921b, Voris 2000).

The two populations clearly correspond to the separated ocean basins of the Bay of Bengal and South China Sea respectively, a situation commonly seen in other marine and semi-marine species (e.g. *Acrochordus* as documented by Hoser 2014).

For the record, the second species from south-east Asia was originally described as *Thalossophis werneri* by Schmidt in 1852 and hence should now be known as *Hydrophis werneri* (Schmidt, 1852).

Inspection of relevant specimens currently identified as *Hydrophis schistosus* (Daudin, 1803) and *Hydrophis werneri* (Schmidt, 1852) readily showed consistent differences between the two putative species.

As there has been no paper ever published separating the two taxa since they were synonymised many years ago I identify the most obvious difference between them here.

Hydrophis schistosus is readily separated from both *Hydrophis zweifeli* and *Hydrophis werneri* by the shape of the supralabial immediately behind the middle eye. It is wider than high, or rarely as wide as high, versus narrower than high in the others. Furthermore the same scale is distinctly rhomboidal in shape versus crescent-shaped in the other two taxa.

Of course bearing in mind that there will no doubt be other differences between the three taxa, it is important that they be properly recognized sooner, rather than later and that is regardless of who the name authority is!

This is before one deals with the conservation aspects of the three species, all of whom inhabit a region of rapidly expanding human populations. Had Ukuwela *et al.* (2012) published head photos of the three taxa, rather than two, the correct identities of the species-level taxa could have been made more widely known sooner.

Quite often unrecognized species can be indicated or located by a judicious re-reading of relevant scientific and other populations, including often about totally unrelated taxa if and when they are affected by the same dispersal or restricting factors.

Key publications of relevance in terms of the classification of the Hydrophiinae and in particular the recognized species most relevant to this paper, this being *Emydocephalus annulatus* Krefft, 1869 and congeners, are cited here and include the following: Adler (1999a, 1999b), Alcala (1986), Alcala *et al.* (2000), Bauer and Sadlier (2000), Bauer and Vindum (1990), Bavay (1869), Berry (1986), Boulenger (1896, 1899, 1908), Burger and Natsuno (1974), Cadle and Gorman (1981), Cadle and Gorman (1981), Cogger (1975, 2000), Cogger *et al.* (1983), David and Ineich (1999), Dotsenko (2011), Golay (1985), Gopalakrishnakone and Kochva (1990), Greer (1997), Heatwole (1999), Heatwole and Cogger (1994), Hoser (2012a, 2012b, 2013), Huang (1996), Hutchinson (1990), Kharin (1985, 2004, 2008, 2009), Kharin and Czeblukov (2009), Krefft (1869), Lukoschek (2007), Lukoschek and Scott Keogh (2006), Lukoschek and Shine (2012), Lukoschek *et al.* (2007), Mao *et al.* (1983), Masanuga and Ota (1994), McCarthy (1985, 1986),

McCosker (1975), McDowell (1969, 1970, 1972, 1974), Minton (1975), Minton and da Costa (1975), Minton and Dunson (1985), Mori (1982), Nock (2001), O'Shea (1996), Rasmussen (1994-1997, 2002), Rasmussen and Ineich (2010), Rasmussen *et al.* (2001, 2011, 2014), Sanders and Lee (2008), Sanders *et al.* (2008, 2012), Schwaner *et al.* (1985), Scott Keogh (1998), Scott Keogh *et al.* (1998, 2000, 2005), Shine (1991), Slowinski and Scott Keogh (2000), Slowinski *et al.* (1997), Smith (1926), Smith *et al.* (1977), Stejneger (1898, 1907, 1910), Ukuwela (2013), Ukuwela *et al.* (2012), Voris (1966, 1972, 1977, 2000) Voris and Voris (1983), Wall (1906, 1909), Wells (2007), Wilson and Swan (2010), Zhao and Adler (1993) and sources cited therein.

Wells (2007) provides one of the best contemporary accounts and bibliography of important publications in terms of Australian hydrophiinae, notwithstanding the fact I do not agree with some of the taxonomic judgements in that paper. Because it is freely available online as a pdf, and not behind a paywall, it is an excellent point of reference for others seeking to study the relevant taxa.

***EMYDOCEPHALUS* KREFFT, 1869.**

The first species described in the genus was *E. annulatus* Krefft, 1869, who assigned the generic name at the same time he named the type species.

In terms of this genus, most specimens in the genus have been referred to the nominate form species by most herpetologists until the last decade (post year 2000).

In same year (1869), another description was published for New Caledonian specimens by Bavay, who named it "*Aipysurus chelonicephalus*". They continue to be treated as *Emydocephalus annulatus* by most herpetologists, noting the proximity of the known distribution in Queensland and (relatively) adjacent New Caledonia as well as because of morphological similarities as outlined by Rasmussen and Ineich (2014).

However in contradiction to this see below.

Emydocephalus ijimae was described by Stejneger in 1898 from Loo Chao Island in the East China Sea but in 1908 was synonymised with *E. annulatus* by Boulenger.

Only recently (in the last 2 decades), since Huang (1996) has it been widely recognized as a different species to *E. annulatus*. However much of the contemporary literature (including internet material) of 2015 still treats both taxa as being one and the same.

The population from the Philippines and nearby Vietnam has been variously treated as being one or other of *E. annulatus* or *E. ijimae*, but as far back as year 2000 it was known to be a taxon of a different species. Alcala *et al.* (2000) reported that they had been advised that Hidetoshi Ota of Japan had made it known he was physically in the process of describing this population as a new species.

In other words, it's formal naming was imminent!

They wrote:

"The third species has been identified as *E. annulatus* (Cogger, 1975), but is considered a new species by Dr. H. Ota of the University of Ryuku, who is currently describing it as new to science (H. Ota, pers comm) (Fig. 1)."

In 2010, Rasmussen and Ineich wrote:
"That new species is not yet described but its description is underway by H. Ota (pers. comm. April 2009)."

The historical record of 2015, shows that no such description was ever published. The *International Code of Zoological Nomenclature* recommends that authors publish names for obviously new and unnamed taxa as soon as practicable and within 12 months. In contempt of the Code, Ota did not do this and eventually in 2011, a Russian by the name of Dotsenko instead named the taxon for the first time (based on a single specimen from Vietnam) calling it *Emydocephalus szczerbaki.* Significant in this is that in further contempt of the Code, Ota was recruited by the Wolfgang Wüster gang to declare war on the Code via a listing as co-author of Kaiser *et al.* (2013), as detailed in Hoser (2012 and 2013b).

The idea that a person can literally hold up progress of science for more than a decade by monopolizing a taxon on the basis of publishing a description of it and then failing to do so is repulsive.

Yet this very concept of one or a few self-appointed so-called scientists monopolizing all reptile taxa, is the basis of the campaign by Kaiser *et al.* (2013).

Of course had I, Raymond Hoser published a description of the same Philippines taxon 11 years after Ota had made it known that he intended doing so, others in his gang would have quickly accused me of "stealing" his God-given naming entitlement!

Notwithstanding the conclusions of Rasmussen and Ineich (2010), I (in contradiction to their overall position) believe their data provides sufficient evidence to warrant recognition of the New Caledonia *Emydocephalus* as being taxonomically distinct from the Australian specimens (both east and west Australian ones).

They can be readily separated from Australian specimens on sight by the fact that females have 26-27 body bands (not counting the tail) versus 19-25 for Australian specimens and divided or partially divided cloacal shield versus usually single in the Australian ones.

The same authors report other differences between both populations (both sexes) as well as consistent differences from the other two taxa.

While it could be asserted that I have assigned excessive taxonomic importance to seemingly slight differences in scalation and colouration, another relatively unusual feature of all *Emydocephalus* gives further weight to the idea that the New Caledonia population is of a different species to the Australian ones. Studies have shown that individuals do not travel far from where they live, with individuals having a home range of just 50 square metres (Alcala *et al.* 2000, Lukoschek and Shine 2012), and usually being found in relatively shallow waters. They are not regarded as a migratory or open seas dwelling (pelagic) species (Alcala *et al.* 2000, Lukoschek and Shine 2012). Hence the likelihood of any gene flow between Australian and New Caledonia populations is not regarded as being likely.

There is a significant area of deep ocean between the Queensland Plateau and the New Caledonia Basin which would presumably form a significant barrier to movement between the regions serving only to enforce the genetic isolation of the east Australian and New Caledonian populations.

On the basis of the preceding and in the absence of molecular evidence to the contrary, it is only reasonable to continue to treat the New Caledonian snakes as being a separate species to those from Australia, and to be called *Emydocephalus chelonicephalus* (Bavay, 1869).

Alcala *et al.* (2000) further discuss the present day distribution of what is now known as *Emydocephalus szczerbaki* Dotsenko, 2011 within the context of sea levels and ocean currents during the Pleistocene ice-age regressions.

This same factor is of significant relevance in terms of the Australian populations of *Emydocephalus.*

Australian Museum records spanning nearly 200 years show that there are two distinctive populations of *Emydocephalus*, as related by Cogger (2000).

The 153 specimens held at Museums across Australia show one population being found exclusively east of Cape York and Torres Strait and the other being found in north-west Western Australia, including Ashmore Reef near Timor. However of note is that the Ashmore reef is at the outer edge of the North Australian Basin and separated from Timor by the deep sea of the Timor Trough.

They are effectively absent from the Arafura Sea.

While much of the near-coastal habitat in the Arafura Sea is different from that of the Queensland and Western Australian,

this being the most common explanation for the absence of *Emydocephalus* there, this is not on its own sufficient to explain the absence.

After all, patches of habitat within the Arafura Sea coastline is suitable for *Emydocephalus* and yet they remain absent.

No doubt this is in significant part due to the non mobile habits of *Emydocephalus* as detailed by Alcala *et al*. (2000). This non-mobility combined with the added fact that until the recent geological past, much of the Arafura Sea consisted of a landlocked plain or basin connected to New Guinea, meant that for most of the Pleistocene the eastern and western Australian populations were never physically connected and similarly unable to reconnect during the relatively brief interglacials.

In summary they have diverged to become different species.

Connections between the two populations of Australian *Emydocephalus* may well have been by movement along the northern New Guinea coastline during the Pliocene or Pleistocene as opposed to along northern Australia. In any event, this means that areas to the north side of island New Guinea may ultimately be found to have populations of *Emydocephalus* where suitable habitat occurs (e.g. Biak).

THE DIVISION OF AUSTRALIAN *EMYDOCEPHALUS*

Inspection of specimens from Western Australia and Queensland show sufficient consistent morphological differences to be recognized as separate species-level taxa.

The molecular evidence of Lukoschek and Scott Keogh (2006) is ambiguous (summarised in table 3 and fig. 3), with an estimated date of divergence for the populations matching the interglacial of about 374-324 thousand years ago.

Taken at its weakest (as outlined by Lukoschek 2007 at page 187, where she claims less than mtDNA 1% sequence divergence between populations) this data shows support for taxonomic recognition of the Western population at least at the subspecies level.

In terms of their molecular results, Lukoschek and Scott Keogh (2006), stated "*Emydocephalus annulatus* also divided into two groups, the north-west Shelf and Great Barrier Reef."

Their data in fig. 3 shows similar divergence between the east and west Australian populations of *Emydocephalus* as between the recognized species *Hydrophis pacificus* Boulenger, 1896 from Australia and *Hydrophis cyanocinctus* Daudin, 1803 from Thailand, which implies inconsistency in the treatment of the two Australian populations of *Emydocephalus* as being taxonomically indistinct.

Combined these factors form a compelling argument for the two widely separated populations to be treated as separate biological entities and therefore as different species and in the face of recent divergence.

Krefft (1869) described two species "*Emydocephalus annulatus*" and "*Emydocephalus tuberculatus*", both being allegedly from "probably the Australian seas".

However the specimens and descriptions of them both clearly match Queensland animals (one being an effectively unbanded snake and the other with body bands), which also accords with all other reptile species named by Krefft as being from the eastern half of Australia (most from the east coast).

This makes both names synonymous for the Queensland population and the Western Australian population unnamed.

In the absence of any available names for the Western Australia *Emydocephalus*, they are herein described as a new species.

EMYDOCEPHALUS TEESI SP. NOV.

Holotype: A preserved specimen number R165708, at the Western Australian Museum, Perth, Western Australia, obtained from Shark Bay, Western Australia, (shot dead) caught on 10 February 2006.

The snout-vent length is 660 mm, tail length is 132 mm and weight is 245.0 grams.

The Western Australian Museum is a government-owned facility that allows inspection of its holdings.

Paratypes: Specimen number R47852 from the Western Australian Museum, Perth, Western Australia collected from Barrow Island, Western Australia, Lat. 115°40'E Long. 20°8'S in December 1975.

Specimen number R28469 from the Western Australian Museum, Perth, Western Australia collected from Barrow Island, Western Australia, Lat. 115°25'E Long. 20°45'S on 9 September 1966.

The Western Australian Museum is a government-owned facility that allows inspection of its holdings.

Diagnosis: *Emydocephalus teesi sp. nov.* would previously have been identified as *E. annulatus*. However it is readily separated from that taxon by having 21-23 body bands in females, versus 24-25 in females of *E. annulatus.* In males there are 19-21 body bands versus 22-30 in *E. annulatus.*

These same characteristics separate *E. teesi sp. nov*. from the otherwise similar *E. chelonicephalus* and *E. szczerbaki.*
Complete melanism is known to be common in *E. annulatus* and *E. chelonicephalus*, but is effectively unknown in *Emydocephalus teesi sp. nov*. and *E. szczerbaki.*
Melanistic *E. teesi sp. nov*. seen in Ashmore Reef, WA retain remnants of cross-bands on the lower flanks as whitish or lighter flecks on the rear of the relevant scales.

Emydocephalus teesi sp. nov. commonly (but not always) has 3 postoculars, versus a standard 2 in *E. annulatus*, *E. chelonicephalus*, *E. ijimae* and *E. szczerbaki* (and some *E. teesi sp.* nov.).
The three postocular condition in *Emydocephalus teesi sp. nov.* is caused by the usual larger lower postocular (seen in other *Emydocephalus*) instead being two smaller ones.

Emydocephalus teesi sp. nov., *E. chelonicephalus* and *E. annulatus* are separated from *E. ijimae* by having 2 prefrontals versus 4 and a not enlarged posterior vertebral row or one that is only weakly so, versus a strongly enlarged posterior vertebral row. *E. ijimae* is characterised by a strongly divided anal plate, which may or may not be present in the other taxa, or in the other taxa may be partially divided.

E. szczerbaki, similar in most respects to *Emydocephalus teesi sp. nov.*, *E. chelonicephalus* and *E. annulatus*, which it would otherwise be identified as, is characterised by having two prefrontals and a moderately enlarged posterior vertebral row. This places this species (*E. szczerbaki*) as being morphologically intermediate to *E. annulatus* (along with *E. teesi sp. nov*. and *E. chelonicephalus*) and *E. ijimae.*

E. szczerbaki is also separated from all other *Emydocephalus* by the fact that the second supralabial ends immediately below the centre of the eye, as opposed to behind the eye in all the other species.

E. chelonicephalus from New Caledonia can be readily separated from Australian specimens on sight by the fact that females have 26-27 body bands (not counting the tail) versus 19-25 for Australian specimens and a strongly divided or partially divided cloacal shield versus usually single in the Australian ones.

Other differences are outlined by Rasmussen and Ineich (2010).

Emydocephalus are separated from all other Hydrophiinae by the following suite of characters:

Three supralabials, the second very long and distinctive; large ventrals, each three or more times as broad as the adjacent body scales; 15 scale rows around the neck; 17 or rarely 15 mid body scale rows; 125-146 ventrals; there are only rudimentary maxillary teeth behind the fangs.

Distribution: Known only from Ashmore Reef in the north (where it appears to be common), along the coast of Western Australia and nearby islands and reefs to Shark Bay, Western Australia in the South.

Conservation implications: In recent years numbers of sea snakes have dropped substantially in the Asmore Reef area without known cause (Collins 2013, Leatherdale 2012, Lukoschek *et al.* 2013a).

Although I should add that so far, this species is one of two species not apparently adversely affected by the decline in sea snakes in the area.

In an online blog about this very taxon and discussing how they tend not to travel, and why this could spell trouble for the species in the future, Lukoschek *et al.* (2013b) wrote on an online blog: ""Perhaps because they are snakes, sea snakes have a very low profile on the conservation agenda. Some populations of coral reef sea snakes have declined sharply over the past ten years, but this has gone largely unnoticed and almost no effort has been made to find out why," Dr Lukoschek says. "We need to pay more attention to these species, particularly because most of the coral reef species that have disappeared from Ashmore Reef are endemic to Australia.""

That the snakes herein described as *Emydocephalus teesi sp. nov.* represent a unique genetic unit is not in dispute. On that basis they need immediate protection from all likely threats and those that may yet need to be identified.

Protection of this (and other) relevant species will not come about by means of a raft of punitive government regulations that do nothing more than stifle research and education, but rather by a cooperative approach from government agencies.

This includes tackling the root cause of most species declines proactively, done via a reduction in the human birth rate and population growth of humans on this planet.

Until this simple problem is solved, most other conservation measures that could be employed by governments and merely akin to shuffling the deck chairs on the Titanic!

Or put another way, the Australian government should immediately stop giving money hand outs to people to breed!

Etymology: Named in honour of Bondi, New South Wales, Australia based lawyer, Alex Tees, for his valuable contributions to wildlife conservation over many decades. Little known is that he played a key role in 1996 in stopping several attempts by the NSW Government and corruptly protected criminals to have the best-selling book "*Smuggled-2: Wildlife Trafficking, Crime and Corruption in Australia*" (Hoser 2006) banned. It was a direct result of the publication of this book that the then NSW Environment Minister, Ms. Pam Allen was forced to publicly admit that wildlife laws in the state banning private ownership of reptiles were both wrong and illegal in themselves and also anti-wildlife conservation.

As a result they were rewritten to allow private ownership of reptiles in NSW for the first time in 23 years, this act physically happening in mid 1997.

The final ban on sales of *Smuggled-2* was lifted on 24 December 1996.

Everyone in NSW who keeps a snake, lizard, turtle or frog as a pet owes Mr. Tees an eternal debt of gratitude and it is fitting that he is honoured with a patronym name for a reptile taxon whose ultimate survival may in the long run be a direct result of his work.

I should also add that as a direct result of the publication of *Smuggled-2*, and what happened in NSW, Western Australia, as the last stand out state banning private ownership of reptiles was forced to fall into line and allow it (private ownership of reptiles) to happen.

This occurred around year 2000, after a 30 year ban, so it is also fitting that it is a West Australian species is named after Mr. Tees. Tees himself has spent considerable time in WA, including working as an environmental lawyer defending the environment against corrupt big government and others who put private profit above public benefit and the survival of species.

CONFLICT OF INTEREST

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

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New Rattlesnakes in the *Crotalus viridis* Rafinesque, 1818 and the *Uropsophus triseriatus* Wagler, 1830 species groups (Squamata:Serpentes:Viperidae:Crotalinae).

RAYMOND T. HOSER

488 Park Road, Park Orchards, Victoria, 3134, Australia.
***Phone*: +61 3 9812 3322 *Fax*: 9812 3355 *E-mail*: snakeman (at) snakeman.com.au**
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ABSTRACT

There have been a series of major reviews of the taxonomy of the *Crotalus* (*Sayersus*) *viridis* and the *Uropsophus triseriatus* Wagler, 1830 species groups in the last 16 years.

Most authors now recognize all or most of the subspecies listed by Klauber (1972) as valid species.

However Pook *et al*. (2000) provided evidence to suggest that the taxa *C. nuntius* Klauber, 1935, *C. callignis* Klauber, 1949, and *C. abyssus* Klauber, 1930 should at best be recognized as subspecies of *C. viridis* Rafinesque, 1820, *C. helleri* Meek, 1905 and *C. lutosus* Klauber, 1930 respectively.

Pook *et al*. (2000) also produced evidence to show significant lineages that warranted taxonomic recognition, including central Californian *C. oreganus* Holbrook, 1840 and a population of *C. helleri* from California, distinct from both nominate *C. helleri* and *C. callignis*.

The more recent data of Davis *et al*. (2016), although incomplete, also supported this contention.

As no names are available for each group, both are formally named according to the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

The central Californian form is herein named *C. funki sp. nov.*. The form from Idyllwild (Sky Island), California is herein named *C. helleri idyllwildi subsp. nov.*.

It has been recognized for some time that there are morphologically distinct populations of *Uropsophus pusillus* (Klauber, 1952) in Mexco that are divided by geological barriers (Campbell and Lamar 2004). In spite of reviews of the *U. triseriatus* group of species including by Bryson *et al*. (2011, 2014), at least two separate morphologically distinct populations remain unrecognized by taxonomists.

This anomaly is corrected with each being formally named for the first time. The population from Sierra de Coalcomán is formally named *Uropsophus pusillus rentoni subsp. nov.* and the population from Nevado de Colima and Volcan de Colima is herein named *Uropsophus pusillus gedyei subsp. nov.*.

Keywords: Taxonomy; snakes; nomenclature; rattlesnake; USA; Mexico; California; Michoacan; Jalisco; Colimna; *Crotalus*; *Uropsophus*; *Sayersus*; *viridis*; *nuntius*; *callignis*; *abyssus*; *helleri*; *lutosus*; *pusillus*; *triseriatus*; new species; *funki*; new subspecies; *idyllwildi*; *rentoni*; *gedyei*.

INTRODUCTION

The iconic Rattlesnakes, treated by many as being of the genus *Crotalus sensu lato* have long been studied in detail by herpetologists.

These snakes are primarily found in North America, including Mexico and among the best known venomous snakes on the planet.

Klauber's works, summarised in his two volume set "*Rattlesnakes*" were published in 1956 and republished in 1972. They represented the culmination of a lifetime's work on Rattlesnakes at all levels and included the results of his own taxonomic reviews in previous decades, which of course followed on from the works of many others before him.

As noted in Klauber (1972), most known forms and variants of Rattlesnakes have been named many times by herpetologists and this is clearly spelt out in the various synonyms lists published in Klauber (1972).

Notwithstanding this, new methods of dealing with taxonomic problems and further fieldwork in what were formerly remote or hard to access locations have yielded forms previously unknown to science.

As of 2016, there are about 50-60 recognized species of Rattlesnake, placed by many authors in the catch-all genus *Crotalus* Linnaeus, 1758.

This genus level taxonomy was given a shake up by Hoser

(2009), who for the first time ever created a genus-level taxonomy that represented the phylogenetic origins of the species.

Hoser (2009) resurrected available names for genera and also erected a number of new genera and subgenera to accommodate species groups and at times single species.

A more recent molecular phylogeny, by Pyron *et al.* (2013) effectively confirmed the validity of the earlier Hoser (2009) taxonomy.

At the species level, no less than four have been formally described since year 2000. These were formally described as *Crotalus campbelli* Bryson *et al*., 2014, *Crotalus ericsmithi* Campbell and Flores-Villela, 2008, *Crotalus tancitarensis* Alvarado Diaz and Campbell, 2004, and *Crotalus tlaloci* Bryson *et al*., 2014.

Using the taxonomy of Hoser (2009), these species would be more appropriately placed in the following genera: *Uropsophus* Wagler, 1830 for *campbelli*, *Cummingea* Hoser, 2009 for *ericsmithi*, *Aechmorphrys* Coues, 1875 for *tancitarensis* and *Uropsophus* Wagler, 1830 for *tlaloci.*

As of 2016, most authors now recognize all or most of the subspecies listed by Klauber (1972) in some species groups as full species, including the *C. viridis* Rafinesque, 1820 species complex.

This is in part why the recognized number of valid species is higher now than when Klauber (1972) was published.

There have also been a series of major reviews of the taxonomy of the *Crotalus* (*Sayersus*) *viridis* and the *Uropsophus triseriatus* Wagler, 1830 species groups in the last 16 years (post-dating year 2000). These are two species diverse groups that have caused frustration for taxonomists due to morphological similarities between forms, disjunct populations, geologically recent separation of populations, a lack of collecting in some relevant regions and other factors.

Pook *et al.* (2000) and Davis *et al.* (2016) provided evidence to suggest that the taxa *C. nuntius* Klauber, 1935, *C. callignis* Klauber, 1949, and *C. abyssus* Klauber, 1936 should at best be recognized as subspecies of *C. viridis* Rafinesque, 1820, *C. helleri* Meek, 1905 and *C. lutosus* Klauber, 1930 respectively.

Pook *et al.* (2000) also produced evidence to show significant lineages that warranted taxonomic recognition, including central Californian *C. oreganus* Holbrook, 1840 and a population of *C. helleri* from California, distinct from both nominate *C. helleri* and *C. callignis*.

However in the sixteen years that have elapsed since that study, neither taxon has been formally named.

As no names are available for each group, both are formally named according to the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

The central Californian form with a distribution centred on the southern coast ranges in the region running south from San Francisco is herein named *C. funki sp. nov.*. The form from idyllwild (sky island), California is herein named *C. helleri idyllwildi subsp. nov.*.

It has also been recognized for some time that there are morphologically distinct populations of *Uropsophus pusillus* (Klauber, 1952) in Mexco that are divided by geological barriers (Campbell and Lamar 2004). The latter authors detailed these barriers in their text.

In spite of reviews of the *U. triseriatus* group of species including by Bryson *et al.* (2011, 2014), at least two separate morphologically distinct populations remain unrecognized by taxonomists.

Notwithstanding the fact that Bryson *et al.* (2011) found this divergence to be recent (Pleistocene), it is appropriate that each population be given taxonomic recognition. This anomaly is corrected with each being formally named for the first time. The population from Sierra de Coalcomán is formally named *Uropsophus pusillus rentoni subsp. nov.* and the population from Nevado de Colima and Volcan de Colima is herein named *Uropsophus pusillus gedyei subsp. nov.*.

For some decades I have been working with Rattlesnakes and their taxonomy and as far back as 1993 viewed some of the Californian *C. viridis* complex snakes (*Sayersus*) and several putative taxa from Mexico as warranting further investigation. This was after having spent time in the field collecting some of them and also viewing significant numbers more in private facilities and museum collections.

This includes the two above mentioned lineages identified by Pook *et al.* (2000) as being genetically divergent as well as several potentially unnamed species within the *U. triseriatus* group.

A substantial amount of data was stolen from my facility here in Australia during an illegal armed raid on 17 August 2011, which effectively scuttled much of the work in progress, due mainly to the fact that the most important of this material was never returned (Court of Appeal, Victoria 2014, VCAT 2015).

Some of the species I had intended naming have been named by others.

However four other taxa as mentioned above, have yet to be formally recognized and are under potential threat from human overpopulation and the environmental destruction this is bringing to the relevant areas.

In the face of this and the reality that the bulk of my relevant research files will not be returned (as of 2016), I have made the decision to publish the most important results of this review so as to allow other scientists to identify the relevant taxa and use the names when publishing papers dealing with aspects of biology and the like, where correct identification of entities is important.

Past herpetological studies have been compromised when groups of taxa have erroneously been treated as one and this appears to have been the case in part for the divergent taxa which are mentioned above.

As no names are available for each group, they are formally named according to the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

The central Californian form of *C. oreganus*, treated by many as part of the so-called *Crotalus viridis* group (*Sayersus*), until now treated as a southern population of *C. oreganus* is herein named *C. funki sp. nov.*. The form of *C. helleri* from Idyllwild (sky island) California (also treated as part of the *C. viridis* group), is herein named *C. helleri idyllwildi subsp. nov.*.

While a number of forms of Mexican Rattlesnake have been formally named in recent years, clearly divergent forms of the putative species *U. pusillus* Klauber, 1952 remain unnamed. These are formally described herein and named for the first time as *U. pusillus rentoni subsp. nov.* and *U. pusillus gedyei subsp. nov.*.

Both these forms are known to be isolated by geographical barriers from the nominate form as outlined in detail by Campbell and Lamar (2004), although significantly they only published a colour image of one of the three forms, indicating that they may not have been aware of the obvious colouration differences between the populations. I make this comment noting that for other taxa, they published photos of well known variants in order to exhibit the known range of morphs.

Campbell and Lamar (2004) did however report on earlier noted differences in scalation between the populations of putative *U. pusillus.*

MATERIALS, METHODS AND RESULTS

The reviewed literature relevant to the taxonomy of these Rattlesnake species and the decisions made herein in terms of formal recognition of them includes the following: Ashton and de Queiroz (2001), Ashton *et al.* (1997), Baird and Girard (1852), Beaman and Hayes (2008), Blainville (1835), Brown and Duvall

Hoser 2016 - Australasian Journal of Herpetology 33:34-41.

(1993), Bryson (2007), Bryson *et al.* (2011, 2014), Bush *et al.* (1996), Campbell and Lamar (1989, 2004), Castro-Franco and Bustos-Zagal (1994), Chiszar and Smith (1993), Chiszar *et al.* (2008), Clause (2015), Cliff (1954), Conant and Collins (1991), Cope (1885), Davis and Smith (1953), Davis *et al.* (2016), Diller and Wallace (2002), Domínguez-Guerrero and Fernández-Badillo (2016), Dorcas (1992), Douglas *et al.* (2002), Eaton (1935), Einfalt (1998), Fitch (1936), Franz (1971), Golla and Durso (2015), Gomez *et al.* (2015), Harris and Simmons (1978), Holbrook (1840), Holding *et al.* (2014), Hoser (2009, 2012), Houston (2006), Jones *et al.* (1981), Keehn *et al.* (2013), Keogh and Wallach (1999), Kisser (1980), Klauber (1930, 1935, 1938, 1940, 1943, 1949, 1952, 1972), Kreuzer (2012), Langner (2014), Lee (1996, 2000), Lemos-Espinal and Smith (2015), Lemos-Espinal *et al.* (1994), Linnaeus (1758), Livo and Chiszar (1994), McCraine (1983), McCraine and Wilson (1979), McDiarmid *et al.* (1999), Meek (1905), Meik and Pires-daSilva (2009), Meik *et al.* (2012), Muñoz-Nolasco *et. al.* (2015), O'Connor (2012), Olivier (2008), Oyler-McCance and Parker (2010), Parker and Brown (1974), Putman *et al.* (2016), Pyron *et al.* (2013), Rafinesque (1818), Schmidt (2008), Schmidt and Shannon (1947), Schneider (1986), Schuett *et al.* (1993), Sievert (2002a, 2002b), Smith (1946), Smith *et al.* (1993), Smith *et al.* (2005), Sparks *et al.* (2015), Starrett (1993), Stebbins (1985), Tanner (1930), Tanner and Lynn (1934), Werning (2012a, 2012b), Wiseman and Kryzer (2015), Woodbury (1929, 1958), Woodbury and Hansen (1950), Zweifel (1952) and sources cited therein.

More significantly however I should note that this review has also been based on the inspection of many specimens (live and dead) and high quality images of these and other rattlesnakes over the past 3 decades, including about 40 odd nominate *U. pusillus* (from all four main populations in Mexico, with the two populations east of the Rio Tepalcatepec headwaters and Rio Ahuijullo Depression being treated herein as one and the same) and over 200 *Crotalus oreganus* and *C. helleri* from California and elsewhere.

Furthermore the relevant taxonomic decisions have been based on an assessment of the geographical and species barriers to the relevant snake populations in view of their historical nature in terms of ascertaining the physical isolation of the relevant groups of snakes and whether or not speciation processes had occurred.

This was for the purpose of determining at what taxonomic level to recognize each relevant group. In only one of the four, did I determine that full species recognition was appropriate, while for the others I took the more conservative view and have designated each as a subspecies.

In terms of species level recognition of the putative *C. oreganus* from central California, I had no hesitation in making this level of recognition. The population appears to be reproductively isolated from all others and the molecular divergences outlined by Pook *et al.* puts these snakes in line with others that already have species-level recognition.

The formal recognition of this species *C.* (*Sayersus*) *funki sp. nov.* as a new species is significant as it is the first new species of Rattlesnake formally named from the United States of America in the present century.

THE DISRUPTIVE AND UNSCIENTIFIC INCURSIONS OF WOLFGANG WUSTER AND HIS GANG OF THIEVES.

It is also appropriate to mention the reaction of a group of group known as the Wüster gang to the publication of Hoser (2009) which was a genus level review of the Rattlesnakes.
That paper adopted a common sense approach to the Rattlesnakes with a new classification at the genus level for these snakes, baed on well established and previously established phylogenetic relationships between species and species groups. The paper resurrected old and little used names for obvious genus groups and formally assigned names to unnamed clades.

The reponse from North American herpetologists at the time, including Joseph Collins, who controlled the internet address "Center for North American Herpetology" or CNAH was favourable, because for the first time in almost a century the fiction that all Rattlesnakes should be in a single genus (*Crotalus*) was properly challenged and dealt with in a sensible manner.

Collins promoted the sensible taxonomy on his website "Centre for North American Herpetology".

Following this, a gang of thieves known as the Wüster gang, led by a pseudo scientist, Wolfgang Wüster from Wales in the UK, commenced an intense campaign to stop other herpetologists adopting the "Hoser taxonomy".

Wüster wrote and published a so-called paper claiming that the journal Hoser (2009) was published in wasn't validly published according to the rules of the *International Code of Zoological Nomenclature* (Wüster and Bérnils, 2011). When this was formally refuted by Hoser (2012a), Wüster and has gang of thieves hatched a plan to organize a mass boycott of the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999) to stop any names proposed by myself or anyone else they took umbrage to from ever being used.

One of the gang of thieves, Hinrich Kaiser, sent a SPAM email that was received by thousands of herpetologists and others worldwide, with a copy inevitably falling into my hands. They called for an all out war against the ICZN and the over 200 year old code of Zoological Nomenclature administered by the ICZN. The plan was thoroughly discredited by Hoser (2012d and 2013), with Hoser (2012d) copying the Kaiser email and plan in full in the journal.

The group attacked journals and editors who used any taxonomy and nomenclature they disapproved of and ran a campaign of hate and lies both online via so-called "social media" (e.g. Facebook, Twitter and chat forums) and in newsletters, journals and other publications they effectively controlled (e.g. Wallach *et al.* 2014).

They even petitioned the *International Commission of Nomenclature* (ICZN) to retrospectively rewrite the rules of the Code to enable their gang to steal "name authority" for over 900 validly named taxa, including species and genera named by such authors as John Edward Gray of the British Museum (e.g. Rhodin *et al.* 2015).

The actions of Wüster and the gang are beneath contempt, totally scientific and also highly illegal. The claims by Rhodin *et al.* (2015) and similar made elsewhere by the gang of thieves were systematically refuted by Hoser (2015a-f) and the many other sources cited therein.

Unable to argue against the merits of the taxonomy proposed by Hoser (2009) and other papers I have published since 1998 dealing with taxonomy and nomenclature, Wüster and their gang of thieves have set on a destructive campaign to attack the rules of the zoological nomenclature (Hoser 2015a-f).

Wüster and associates have aggressively embarked on a campaign to illegally rename each and every taxon formally named by myself and others they have taken a dislike to (so far totalling several hundred potential illegal junior synonyms) and then bludgeon others to use their illegal names in a form of "mob rule" not unlike that seen by so-called Islamic State, or ISIS terrorists in the Middle East.

The illegal actions of Wüster and his gang of thieves should not be tolerated and there is no doubt that history will judge them and their supporters harshly.

I suppose it is worth mentioning that a molecular phylogeny of the world's snakes published by Pyron *et al.* (2013) effectively validated the findings of Hoser (2009) that *Crotalus* as recognized prior was not a monotypic genus.
That Pyron *et al.* (2013) confirmed my earlier findings in earlier papers did not lead to the Wüster gang reversing their attacks on me.

Far from it!

Denzer *et al.* (2016) went further and accused me of stealing the work of their gang. In a long-winded rant of hate and lies, they accused me of plagiarization (theft of the works of others without attributing their work).

By way of example Denzer *et al.* (2016) wrote:
"The taxonomic basis for Hoser's proposals on *Laudakia* can be found in their entirety in Macey *et al.* (1998, 2000b, 2006). Most of Hoser's proposed classification additionally reflects nodes in the phylogeny published by Pyron *et al.* (2013)."

The authors were also repatedly alleging that I had stolen Pyron's work without citing him.

The problem with their claim is that the relevant *Laudakia* paper was actually published in 2012, a full year before Pyron's phylogeny was even published!

Furthermore, five relevant papers by Macey *et al.* were cited in the *Laudakia* paper (Hoser 2012c), meaning their earlier findings were in fact fully credited when used!

I also note here that the name *Uropsophus* subject of a "ban" by Wüster and his gang is not in fact a creation of mine. It was first "coined" by Wagler, way back in 1830!

Incidentally, at the time he coined *Uropsophus*, Wagler did not produce a shred of scientific evidence to support his proposal.

However there are rules to be applied and used in terms of the *International Code of Zoological Nomenclature*. It is the first available genus-level name to be formally used for the clade of snakes known as the "*triseriatus*" group of species and under the rules of homonymy and priority must be used.

Wüster and his gang must not be allowed to engage in reckless acts of taxonomic vandalism to coin a new name for the group or to force others to use their illegal nomenclature.

They seek to do this for their own personal self-gratification and for no otherwise proper reason.

CROTALUS (SAYERSUS) FUNKI SP. NOV.

Holotype: A preserved specimen at the California Academy of Sciences, USA, specimen number: CAS HERP 210493 collected from Waddell Creek, Santa Cruz County, California, USA, Lat. 37.11, Long. -122.27.

This facility allows access to its holdings.

Paratypes: Two preserved specimens at the California Academy of Sciences, USA, specimen number: CAS HERP 210492 and 210494 collected from Waddell Creek, Santa Cruz County, California, USA Lat. 37.11, Long. -122.27.

Diagnosis: Until now *C. funki sp. nov.* has been treated as a regional variant of *C. oreganus*. It is readily distinguished from that species by the presence of a distinct whiteish-yellow band or stripe running across the head between eyes and distinct black borders of the darker brown dorsal body blotches, versus neither in *C. oreganus*, or at best only indistinct for one or other or both traits.

A detailed diagnosis to separate *C. oreganus* (treated as subspecies), and this species (which until now has been treated as *C. oreganus* and would otherwise key out as it), from all other living Rattlesnakes is in Klauber (1972) or Campbell and Lamar (2004).

Distribution: The general area from San Francisco and Alameda County California in the north, along the coastal strip, including nearby hills to south of San Louis Obispo County, California, USA, in a broad swathe covering most of the southern Coast Ranges, with the possible exception of the far southernmost areas, where *C. helleri* occurs.
The distribution of this taxon is bounded by the allopatric distribution of *C. oreganus* to the north and *C. helleri* to the south and broadly mirrors that of putative nominate *Elgaria multicarinata multicarinata* (Blainville, 1835).

Etymology: Named in honour of Dr. Richard Funk, veterinary surgeon of Mesa Arizona for services to herpetology spanning many decades.

CROTALUS HELLERI IDYLLWILDI SUBSP. NOV.

Holotype: A preserved specimen at the San Diego Natural History Museum, USA, specimen number: 60330 (Herps) collected from Idyllwild, California, USA, Lat. 33.74, Long. -116.72.

This is a facility that allows access to its holdings.

Diagnosis: *C. helleri idyllwildi subsp. nov.* is readily separated from other *C. helleri* by the very dark brownish-grey pattern on the dorsum, broken with very distinctive narrow light yellowish-white markings, forming a somewhat reticulated pattern. By contrast, normal *C. helleri helleri* (or *C. helleri callignis*) from elsewhere are characterised by a much lighter overall colouration consisting of a yellowish brown colouration on the upper body, punctuated with large and irregular dark brown blotches running along the midline. Rarely dark *C. helleri helleri* do occur, but these are characterised by dark colouration all over, as opposed to having the bright markings on the darker body background as seen in *C. helleri idyllwildi subsp. nov.*.

A detailed diagnosis to separate *C. helleri* and *C. callignis* (treated as subspecies), and this species (which until now has been treated as *C. helleri* and would otherwise key out as it), from all other living Rattlesnakes is in Klauber (1972) or Campbell and Lamar (2004).

Distribution: Known only from the hills in the region of the type locality, as in areas near Mount San Jacinto, California, USA.

Etymology: Named in refelection of the type locality for the taxon.

UROSOPHUS PUSILLUS RENTONI SUBSP. NOV.

Holotype: A preserved specimen at the California Academy of Science (CAS), United States of America, specimen number: CAS HERP 165284, collected along Paso Malo Road, 15.0 mi W of the junction of the Dos Aguas-to-Varalosa road. (or 20.6 mi E of Puerto Las Cruces) , Sierra de Coalcoman, Mexico.

The California Academy of Science (CAS), USA is a facility that allows access to its holdings by scientists.

Paratype: A preserved specimen at the Royal Ontario Museum (ROM), Canada, specimen number: ROM Reptiles and Amphibians 47056, collected at Sierra de Coalcoman, Michoacan, Mexico.

Diagnosis: The three subspecies of *Uropsophus pusillus* (Klauber, 1952) can be readily separated from one another by colouration. Nominate *U. pusillus pusillus* is characterised by a mainly light coloured head (upper surface) with a small number of dark spots or small blotches. *C. pusillus rentoni subsp. nov.* is instead characterised by a mainly light coloured head (upper surface) with large areas of darker pigment both anterior to and posterior to the eyes, but still with significant areas of lighter pigment on the upper head. *C. pusillus gedyei subsp. nov.* is characterised by a head that is dominated by darker greyish-brown pigment on most parts of the head, with the exception of the lightening near the temples, which forms a semidistinct temporal streak. In both *U. pusillus pusillus* and *C. pusillus rentoni subsp. nov.* the lightening that forms the temporal streak is very distinct. The snakes depicted in plate 930 of Campbell and Lamar (2004) and Fig 2.49 of Klauber (1972) volume 1, are both consistent with other specimens I have inspected of *C. pusillus rentoni subsp. nov.*.

The banding of the tail in *C. pusillus gedyei subsp. nov.* is only semidistinct, versus very distinct in both *U. pusillus pusillus* and *C. pusillus rentoni subsp. nov.*.

C. pusillus gedyei subsp. nov. is further separated from the other two subspecies by a greater preponderance of darker markings or dark pigment on the lower flanks (being a significant amount), versus a mainly lighter background with small spots or flecks in the other two subspecies.

The flanks of *U. pusillus pusillus* are generally light in colour with widely spaced smallish spots. By contrast the flanks in *U. pusillus rentoni subsp. nov.* are generally light in colour with

widely spaced smallish spots and additional dark flecks between these spots.

In *U. pusillus gedyei subsp. nov*. the black etching of the dorsal spots is distinct, whereas the same etching is either absent or indistinct in the other two subspecies.

Duellman (1961) noted that specimens from Cerro Tancitaro (*U. pusillus pusillus*) tend to have fewer dorsal blotches (33-46) than specimens from the Sierra de Coalcoman (*U. pusillus rentoni subsp. nov.*).

U. pusillus gedyei subsp. nov. appears to sit between these two extremes.

In *U. pusillus gedyei subsp. nov*. the darker dorsal spots are enlarged and often largely fused along the midline on one side or other giving the snake a distinctly saddled appearance not seen in the other two subspecies.

U. pusillus is readily separated from similar species by the following unique suite of characters: 2 more-or less symmetrical prefrontals, versus 3 or more irregular scales immediately posterior to the internasals in *U. triseriatus* and other species of *Uropsophus.*

Detailed descriptions of *U. pusillus*, (including all three subspecies described herein), including by way of separating all similar species of Rattlesnakes, can be found in Klauber (1972) and Campbell and Lamar (2004), including by way of separation from more recently described long-tailed species and those in the *U. triseriatus* group, as well as all the *C. viridis* species complex.

Distribution: *U. pusillus rentoni subsp. nov.* is found in southwestern Michoacan in the Sierra de Coalcoman, Mexico.

Etymology: Named in honour of Ian Renton of Paradise, South Australia, Australia owner of Snake-away Services, in recognition of his services to herpetology and wildlife conservation over some decades.

UROSOPHUS PUSILLUS GEDYEI SUBSP. NOV.

Holotype: A preserved specimen at the Natural History Museum of Los Angeles County (LACM) specimen number: LACM Herps 25947, collected at 9 miles West of Atenquique, Jalisco, Mexico.

Diagnosis: The three subspecies of *Uropsophus pusillus* (Klauber, 1952) can be readily separated from one another by colouration. Nominate *U. pusillus pusillus* is characterised by a mainly light coloured head (upper surface) with a small number of dark spots or small blotches. *C. pusillus rentoni subsp. nov*. is instead characterised by a mainly light coloured head (upper surface) with large areas of darker pigment both anterior to and posterior to the eyes, but still with significant areas of lighter pigment on the upper head. *C. pusillus gedyei subsp. nov*. is characterised by a head that is dominated by darker greyish-brown pigment on most parts of the head, with the exception of the lightening near the temples, which forms a semidistinct temporal streak. In both *U. pusillus pusillus* and *C. pusillus rentoni subsp. nov*. the lightening that forms the temporal streak is very distinct. The snakes depicted in plate 930 of Campbell and Lamar (2004) and Fig 2.49 of Klauber (1972) volume 1, are both consistent with other specimens I have inspected of *C. pusillus rentoni subsp. nov.*.

The banding of the tail in *C. pusillus gedyei subsp. nov*. is only semidistinct, versus very distinct in both *U. pusillus pusillus* and *C. pusillus rentoni subsp. nov.*.

C. pusillus gedyei subsp. nov. is further separated from the other two subspecies by a greater preponderance of darker markings or dark pigment on the lower flanks (being a significant amount), versus a mainly lighter background with small spots or flecks in the other two subspecies.

The flanks of *U. pusillus pusillus* are generally light in colour with widely spaced smallish spots. By contrast the flanks in *U. pusillus rentoni subsp. nov.* are generally light in colour with widely spaced smallish spots and additional dark flecks between these spots.

In *U. pusillus gedyei subsp. nov*. the black etching of the dorsal spots is distinct, whereas the same etching is either absent or indistinct in the other two subspecies.

Duellman (1961) noted that specimens from Cerro Tancitaro (*U. pusillus pusillus*) tend to have fewer dorsal blotches (33-46) than specimens from the Sierra de Coalcoman (*U. pusillus rentoni subsp. nov.*).

U. pusillus gedyei subsp. nov. appears to sit between these two extremes.

In *U. pusillus gedyei subsp. nov*. the darker dorsal spots are enlarged and often largely fused along the midline on one side or other giving the snake a distinctly saddled appearance not seen in the other two subspecies.

Distribution: *U. pusillus gedyei subsp. nov*. is found in the extreme western Volcanic Belt in southern Jalisco and adjacent Colima, Mexico.

Etymology: Named in honour of Andrew Gedye of Cairns, North Queensland, Australia, formerly of Cheltenham, Victoria, Australia, in recognition of his services to herpetology and wildlife conservation over some decades including through his captive breeding of rare and endangered species.

NOTES ON THE DESCRIPTIONS FOR ANY POTENTIAL REVISORS

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

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CONFLICT OF INTEREST

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

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Not a monotypic genus!
Aplopeltura boa (Boie, 1828) divided!

RAYMOND T. HOSER

488 Park Road, Park Orchards, Victoria, 3134, Australia.
***Phone*: +61 3 9812 3322 *Fax*: 9812 3355 *E-mail*: snakeman (at) snakeman.com.au**
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ABSTRACT

Until now the Blunt-headed Slug Eating Snake from South-east Asia (Family: Pareidae), has been treated as being of a single species, namely *Aplopeltura boa* (Boie, 1828). However inspection of specimens from across the known range, shows that they are sufficiently divergent from one another in geographically separated populations to warrant being named as separate species. Available distributional and molecular evidence supports this contention.

Hence the previously monotypic genus *Aplopeltura* Duméril, 1853 is herein divided into six well-defined species, five formally named for the first time according to the *International Code of Zoological Nomenclature* (Ride *et al*. 1999).

Another species within the Pareidae, namely *Pareas carinatus* (Boie, 1828) is known to have divergent populations, which have been variously described as species and subspecies.
Recognizing the three previously named forms (including the nominate one) herein as subspecies, two more obviously unnamed geographically separated subspecies are also formally named for the first time.

Keywords: Taxonomy; Snakes; South-east Asia; Asia; *Aplopeltura*; *boa*; new species; *shireenae*; *omarelhelou*; *lynnejohnstoneae*; *daranini*; *gibbonsi*; new subspecies; *sumatrensis*; *malayensis*.

INTRODUCTION

Until now the Blunt-headed Slug Eating Snake from south-east Asia (Family: Pareidae), has been treated as being of a single widespread species, namely *Aplopeltura boa* (Boie, 1828). However inspection of specimens by myself over some years from across the known range, shows that they are sufficiently divergent from one another in geographically separated populations to warrant being named as separate species.

Significant data was obtained from across the range of the putative species, but this was stolen in an illegal armed raid on my facility on 17 August 2011 by corrupt wildlife officers seeking to permenantly disable my successful wildlife education business, "Snakebusters, Australia's best reptiles shows" (Court of Appeal Victoria 2014, VCAT 2015).

None of this material was returned.

Shortly after this illegal armed raid, Hoser (2012a) did the obvious step of dividing the related genus *Pareas* Wagler, 1830 as then known, along obvious morphological and phylogenetic lines. Hoser (2012a) also erected a subgenus for another divergent lineage.

As the extensive data gathered relevant to the species-level taxonomy was not returned, this material was not published in 2012.

However with ongoing environmental distruction in the South-east Asian realm coupled with the fact that this is likely to get worse rather than better in the foreseeable future, it is important that regional populations warranting taxonomic recognition get this sooner, rather than later, so as not to jeopardize their very existence.

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

Noting that publicly available distributional and molecular evidence supports the contention that there is more than one species under the label *Aplopeltura boa*, I have now made the decision to formally name the most obviously divergent groups in accordance with the *International Code of Zoological Nomenclature* (Ride *et al*. 1999).

Hence the previously monotypic genus *Aplopeltura* Duméril, 1853 is herein divided into six well-defined species, five formally named for the first time.

I also note that relevant texts (e.g. Das 2012) speak of putative *Aplopeltura boa* as being widely distributed throughout the South-east Asian realm. However a survey of museum holdings records suggests that the distribution is somewhat disjunct and largely confined to hilly areas and those immediately proximate to them. See for example the distribution data in David and Vogel (1996).

Hence the concept that currently divided populations were most likely similarly divided during recent glacial maxima is the one I am subscribing to and in the absence of evidence to the contrary.

While putative *Aplopeltura boa* vary significantly in both

colouration and scalation within a single locality, there are differences that are consistent between locations and these are used as the basis to diagnose each species.

Another species within the family Pareidae, namely *Pareas carinatus* (Boie, 1828) is known to have divergent populations, which have been variously described as species and subspecies.

The best known of these is *P. nuchalis* (Boulenger, 1900), treated by authors in the past as either a full species, or a synonym of *P. carinatus*.
While Hoser (2012a) treated *P. nuchalis* as a full species, in accordance with the views of de Rooij (1917), Malkmus (1996), Malkmus *et al.* (2002) and evidence of Guo *et al.* (2011), this was contradicted by the results of Pyron *et al.* (2013), that implied *P. nuchalis* was conspecific with *P. carinatus*.
In light of this new evidence of Pyron *et al.* (2013) and that of Guo *et al.* (2011), I herein conservatively treat both *P. nuchalis* and the previously described subspecies of *P. carinatus* described as *Amblycephalus carinatus unicolor* Bourret, 1934 as subspecies of *P. carinatus.*
Recognizing the three previously named forms, including the nominate one herein as subspecies, two more obviously unnamed geographically separated subspecies are also formally named for the first time.

As for *A. boa* above, I also note that relevant texts (e.g. Das 2012) speak of putative *P. carinatus* as being widely distributed throughout the South-east Asian realm. However a survey of museum records suggests that the distribution is somewhat disjunct (but wider than for *A. boa*) and largely confined to hilly areas and those immediately proximate to them. See for example the distribution data in David and Vogel (1996).

I also note that the basis or material and methods underpinning the taxonomy herein has been an inspection of live and dead specimens, photos with good locality data and the relevant available literature that summarizes relevant facts about the relevant taxa.
Museum records were audited to ascertain the extent of known populations, via collection records and localities.

The results are of course the formal taxonomic proposals within this paper as outlined both above and in the descriptions below.

Important references relevant to *Aplopeltura* and the taxonomic decisions within this paper include the following: Boie (1828), Boulenger (1894, 1896), Chan-ard *et al.* (2015), Cox *et al.* (1998), Das (2012), David and Vogel (1996), de Rooij (1917), Dowling and Jenner (1998), Duméril (1853), Grandison (1978), Grismer *et al.* (2010), Grossmann and Tillack (2001), Hofmann (2015), Hoser (2012a), Kopstein (1938), Manthey and Grossmann (1997), Pyron *et al.* (2013), Schlegel (1837), Smith (1943), Taylor (1965), Teynié *et al.* (2010), Tweedie (1950) and sources cited therein.

Important references relevant to *Pareas carinatus* (Boie, 1828), as recognized to date including the taxon, *P. nuchalis* (Boulenger, 1900), either as a full species, subspecies of *P. carinatus* or treated as synonymous to it, include: Boie (1828), Boulenger (1900), Chan-ard and Nabhitabhata (2015), Chan-ard *et al.* (1999), Cox *et al.* (1998), Danaisawadi *et al.* (2016), Das (2012), de Rooij (1917), David and Vogel (1996), Dowling and Jenner (1998), Geissler *et al.* (2011), Götz (2001, 2002), Grismer *et al.* (2008), Guo and Deng (2009), Hoser (2012a), Kopstein (1936, 1938), Lang (2012), Malkmus and Sauer (1996), Malkmus *et al.* (2002), Manthey and Grossmann (1997), Mertens (1930), Pauwels *et al.* (2003), Pyron *et al.* (2013), Sang *et al.* (2009), Savage (2015), Schlegel (1837), Schmidt and Kunz (2005), Sclater (1891), Smedley (1931), Smith (1943), Stuart and Emmett (2006), Taylor (1965), Teynié *et al.* (2010), Wagler (1830), Zhao and Adler (1993), Ziegler *et al.* (2006, 2007) and sources cited therein.

NOTES ON THE DESCRIPTIONS FOR ANY POTENTIAL REVISERS

Unless mandated by the rules of the *International Code of Zoological Nomenclature*, none of the spellings of the newly proposed names should be altered in any way. Should one or more newly named taxa be merged by later authors to be treated as a single species, the order of prority of retention of names should be the order as listed in the keywords part of the abstract.

APLOPELTURA SHIREENAE SP. NOV.

Holotype: A preserved specimen held at the Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, USA, specimen number: CM Herps R2427, collected from Agusan Province, Mindanao, Philippines, Asia. The Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, USA, allows access to its holdings.

Paratypes: Two preserved specimens held at the Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, USA, specimen numbers: CM Herps R2428 and CM Herps R2429, collected from Agusan Province, Mindanao, Philippines, Asia.

Diagnosis: *Aplopeltura shireenae sp. nov.* from the main Philippine Islands, including Mindanao, are readily separated from all other *Aplopeltura* species by the following suite of characters: A generally very indistinct dorsal pattern, being a light reddish-brown in colour, the lateral white blotches rising from the belly on the lower flanks are so heavily shaded that they are barely noticeable and this includes for the anterior section of the body, which is only similarly seen in *Aplopeltura lynnejohnstoneae sp. nov.* from the lower Malay Peninsula. *A. shireenae sp. nov.* is separated from *A. lynnejohnstoneae sp. nov.* by several characters including a lack of melanism on the dorsal surface of the head (see in *A. lynnejohnstoneae sp. nov.*) and a lack of the profuse blackish specking seen on the dorsal surface of *A. lynnejohnstoneae sp. nov.*.

The top of the head of *A. shireenae sp. nov.*, while also reddish brown in colour has two distinct white patches somewhat anterior to the eyes, pointing towards the middle of the head, but not meeting. The iris is brownish in colour and characterised by the presence of whitish specks.

Aplopeltura boa (Boie, 1828) from Java is readily separated from others in the genus (as defined herein) by significant somewhat irregular shaped white patches along the dorsal midline. The dark patch below the eye that commences on the jawline, does not extend as far as the eye or if so, only just intersects it.

Aplopeltura omarelhelou sp. nov. from southern Thailand on the Isthumus of Kra in the region generally north of and including Songkhla and Trang are readily separated from those on the lower Malay Peninsula (*A. lynnejohnstoneae sp. nov.*) and all other species of *Aplopeltura* by the well defined whitish etchings on the rear margins of otherwise darker labials.
A. omarelhelou sp. nov. are also separated from the other species by the obvious dark purplish red markings on the head and dorsal surface.

White markings in the form of irregular shaped, but vaguely triangular blotches are very distinct and well defined in *A. omarelhelou sp. nov.*, as opposed to being either moderately well-defined or poorly defined in all other species.
Aplopeltura lynnejohnstoneae sp. nov. from the lower Malay Peninsula are readily separated from all other species of *Aplopeltura* by having significant melanism on the upper surface of the head, very white upper labials, the white lacking any darker pigment, sheen or flecks as seen in all other species, this being except for a small triangular dark patch under the eye (such a dark patch in one form or other is seen in all species), but which is far narrower than the eye itself in this species, and an indistinct dorsal pattern also defined by the presence of numerous irregular black or blackish flecks throughout.

Aplopeltura daranini sp. nov. from Sumatra is readily separated from all other species of *Aplopeltura* by being similar in most

respects to *A. lynnejohnstoneae sp. nov.* as defined above, but by the following obvious differences. It has an orange sheen or peppering over the white upper labials so that they do not appear to be an immaculate white in colour, as well as the markings of the iris. In *A. lynnejohnstoneae sp. nov.* the iris is more-or-less of one colour being a brownish colour, wheras in *A. daranini sp. nov.* the iris is generally whitish in colour, but with darker reddish veins or markings running more-or-less radially out from the centre. On *A. daranini sp. nov.* the indistinct dorsal pattern is defined by the presence of irregular black spots as opposed to smaller blackish flecks as seen in *A. lynnejohnstoneae sp. nov.*.

Aplopeltura gibbonsi sp. nov. from Borneo is separated from all other *Aplopeltura* by the following characters: Having a reasonably distinct dorsal pattern consisting of irregular markings or blotches on the dorsal surface, the most obvious ones being an orangeish red in colour. The white markings on the lower flanks and white parts of the upper labials are heavily peppered making them appear to be off-white and a shade of the peppering, or alternatively fully shaded as another colour anyway (e.g. yellow). The dark patch under the eye is also well-broken by one or more streaks of white pigment, this also being well peppered or shaded by a colour such as yellow, orange or red.

Members of the family Pareidae (alternatively referred to as the Pareatidae) are unique among Southeast Asian snakes and diagnosed in having large scales overlapping on their chins rather than having them separated by a straight groove. These snakes are known to feed mainly on terrestrial molluscs.

They have short skulls; relatively large eyes; a large nasal gland; have a relatively low number of scales at mid body (13-15 rows); the chin shields have no midline groove, and extend across the chin; they are nocturnal; they feed mostly upon gastropods and small vertebrates; and they lay eggs.

The maxillary bone is very short, deep and with 5 or 6 subequal mandibular teeth gradually decreasing in length. The head is distinct from the neck; eye moderate, with a vertical pupil; nasal single. Body more or less compressed; scales smooth or feebly keeled, without pits, more or less oblique, in 13-15 rows, vertebral row may be enlarged or not (depending on the genus). Ventrals rounded. Tail moderate or short; subcaudals divided.

Observations on captive and wild snakes eating snails suggests that they rest the upper jaw on a snail (preferred food) and use the mandibles to pull the snail's body out of its shell. These are thought to represent a basal lineage of the advanced snakes (Caenophidia).

There are 4 recognized genera and about 15 species currently recognized (before the publication of this paper), all inhabiting Southeast Asia.

Genus *Aplopeltura* Duméril, 1838 has until now been treated as being monotypic for the species *A. boa* (Boie, 1828), but split six ways in this paper, with five new species formally named.

Snakes in the genera *Aplopeltura* Duméril, 1838 and *Asthenodipsas* Peters, 1864 are considerably thinner in build and show significant vertical compression (also seen as a distinct midline ridge along the back), that is not seen in *Pareas* Wagler, 1830 or *Katrinahoserserpenea* Hoser, 2012 as recognized to date.

Aplopeltura has 26-55 single subcaudals, versus 88-120 divided subcaudals in *Asthenodipsas* as well as numerous other differences at outlined by Boulenger (1896) in his species-level descriptions.

Distribution: Philippine Islands.

Etymology: Named in honour of my wife, Shireen Hoser in recognition of many years services to herpetology and zoological taxonomy, including successfully assisting in petitioning the ICZN to stop taxonomic vandalism in the 1990's, in a case where Robert George Sprackland of the USA attempted to unlawfully steal "name authority" for a species of monitor lizard formally named by Richard Wells and Cliff Ross Wellington, some years earlier (Hoser 2007).

APLOPELTURA OMARELHELOU SP. NOV.

Holotype: A preserved specimen at the KU Biodiversity Institute and Natural History Museum, University of Kansas, Lawrence. USA, specimen number: KU KUH 328493, collected at Mountain View Bungalos, near the entrance to the Khao Sok National Park, Thailand, Latitude 8.91, Longitude 98.53.

This is a facility that allows access to its holdings.

Diagnosis: *Aplopeltura omarelhelou sp. nov.* from southern Thailand on the Isthumus of Kra in the region generally north of and including Songkhla and Trang are readily separated from those on the lower Malay Peninsula (*A. lynnejohnstoneae sp. nov.*) and all other species of *Aplopeltura* by the well defined whitish etchings on the rear margins of otherwise darker labials. *A. omarelhelou sp. nov.* are also separated from the other species by the obvious dark purplish red markings on the head and dorsal surface.

White markings in the form of irregular shaped, but vaguely triangular blotches are very distinct and well defined in *A. omarelhelou sp. nov.*, as opposed to being either moderately well-defined or poorly defined in all other species.
Aplopeltura lynnejohnstoneae sp. nov. from the lower Malay Peninsula are readily separated from all other species of *Aplopeltura* by having significant melanism on the upper surface of the head, very white upper labials, the white lacking any darker pigment, sheen or flecks as seen in all other species, this being except for a small triangular dark patch under the eye (such a dark patch in one form or other is seen in all species), but which is far narrower than the eye itself in this species, and an indistinct dorsal pattern also defined by the presence of numerous irregular black or blackish flecks throughout.

Aplopeltura shireenae sp. nov. from the main Philippine Islands, including Mindanao, are readily separated from all other *Aplopeltura* species by the following suite of characters: A generally very indistinct dorsal pattern, being a light reddish-brown in colour, the lateral white blotches rising from the belly on the lower flanks are so heavily shaded that they are barely noticeable and this includes for the anterior section of the body, which is only similarly seen in *Aplopeltura lynnejohnstoneae sp. nov.* from the lower Malay Peninsula. *A. shireenae sp. nov.* is separated from *A. lynnejohnstoneae sp. nov.* by several characters including a lack of melanism on the dorsal surface of the head (see in *A. lynnejohnstoneae sp. nov.*) and a lack of the profuse blackish specking seen on the dorsal surface of *A. lynnejohnstoneae sp. nov.*.

The top of the head of *A. shireenae sp. nov.*, while also reddish brown in colour has two distinct white patches somewhat anterior to the eyes, pointing towards the middle of the head, but not meeting. The iris is brownish in colour and characterised by the presence of whitish specks.

Aplopeltura boa (Boie, 1828) from Java is readily separated from others in the genus (as defined herein) by significant somewhat irregular shaped white patches along the dorsal midline. The dark patch below the eye that commences on the jawline, does not extend as far as the eye or if so, only just intersects it.

Aplopeltura daranini sp. nov. from Sumatra is readily separated from all other species of *Aplopeltura* by being similar in most respects to *A. lynnejohnstoneae sp. nov.* as defined above, but by the following obvious differences. It has an orange sheen or peppering over the white upper labials so that they do not appear to be an immaculate white in colour, as well as the markings of the iris. In *A. lynnejohnstoneae sp. nov.* the iris is more-or-less of one colour being a brownish colour, wheras in *A. daranini sp. nov.* the iris is generally whitish in colour, but with darker reddish veins or markings running more-or-less radially out from the centre. On *A. daranini sp. nov.* the indistinct dorsal pattern is defined by the presence of irregular black spots as

opposed to smaller blackish flecks as seen in *A. lynnejohnstoneae sp. nov.*.

Aplopeltura gibbonsi sp. nov. from Borneo is separated from all other *Aplopeltura* by the following characters: Having a reasonably distinct dorsal pattern consisting of irregular markings or blotches on the dorsal surface, the most obvious ones being an orangeish red in colour. The white markings on the lower flanks and white parts of the upper labials are heavily peppered making them appear to be off-white and a shade of the peppering, or alternatively fully shaded as another colour anyway (e.g. yellow). The dark patch under the eye is also well-broken by one or more streaks of white pigment, this also being well peppered or shaded by a colour such as yellow, orange or red.

Members of the family Pareidae (alternatively referred to as the Pareatidae) are unique among Southeast Asian snakes and diagnosed in having large scales overlapping on their chins rather than having them separated by a straight groove. These snakes are known to feed mainly on terrestrial molluscs.

They have short skulls; relatively large eyes; a large nasal gland; have a relatively low number of scales at mid body (13-15 rows); the chin shields have no midline groove, and extend across the chin; they are nocturnal; they feed mostly upon gastropods and small vertebrates; and they lay eggs.

The maxillary bone is very short, deep and with 5 or 6 subequal mandibular teeth gradually decreasing in length. Head is distinct from the neck; eye moderate, with a vertical pupil; nasal single. Body more or less compressed; scales smooth or feebly keeled, without pits, more or less oblique, in 13-15 rows, vertebral row may be enlarged or not (depending on the genus). Ventrals rounded. Tail moderate or short; subcaudals divided.

Observations on captive and wild snakes eating snails suggests that they rest the upper jaw on a snail (preferred food) and use the mandibles to pull the snail's body out of its shell. These are thought to represent a basal lineage of the advanced snakes (Caenophidia).

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Snakes in the genera *Aplopeltura* Duméril, 1838 and *Asthenodipsas* Peters, 1864 are considerably thinner in build and show significant vertical compression (also seen as a distinct midline ridge along the back), that is not seen in *Pareas* Wagler, 1830 or *Katrinahoserserpenea* Hoser, 2012 as recognized to date.

Aplopeltura has 26-55 single subcaudals, versus 88-120 divided subcaudals in *Asthenodipsas* as well as numerous other differences at outlined by Boulenger (1896) in his species-level descriptions.

Distribution: Southern Thailand on the Isthumus of Kra in the region generally north of and including Songkhla and Trang.

Etymology: Named in honour of Omar Elhelou of Melbourne, Victoria, Australia, owner of Precision Security Australia who has made a significant contribution to wildlife conservation and research in Australia by by installing security systems to safeguard the animals and property of Snakebusters: Australia's best reptile shows.

The patronym name would in the normal course of events be designated as "*omarelhelou*" instead of the designated name "*omarelhelou*" but the spelling I have given it in this paper is deliberate and should not be amended unless mandated by the *International Code of Zoological Nomenclature.*

APLOPELTURA LYNNEJOHNSTONEAE SP. NOV.

Holotype: A preserved specimen at the Field Museum of Natural History (FMNH), Chicago, Illinois, USA, specimen number: 143540, collected at Selangor, Peninsular Malaysia. This is a facility that allows access to its holdings.

Paratype: A preserved specimen at the Field Museum of Natural History (FMNH) Chicago, Illinois, USA, specimen number: 183769, collected at Selangor, Peninsular Malaysia.

Diagnosis: *Aplopeltura lynnejohnstoneae sp. nov.* from the lower Malay Peninsula are readily separated from all other species of *Aplopeltura* by having significant melanism on the upper surface of the head, very white upper labials, the white lacking any darker pigment, sheen or flecks as seen in all other species, this being except for a small triangular dark patch under the eye (such a dark patch in one form or other is seen in all species), but which is far narrower than the eye itself in this species, and an indistinct dorsal pattern also defined by the presence of numerous irregular black or blackish flecks throughout.

Aplopeltura shireenae sp. nov. from the main Philippine Islands, including Mindanao, are readily separated from all other *Aplopeltura* species by the following suite of characters: A generally very indistinct dorsal pattern, being a light reddish-brown in colour, the lateral white blotches rising from the belly on the lower flanks are so heavily shaded that they are barely noticeable and this includes for the anterior section of the body, which is only similarly seen in *Aplopeltura lynnejohnstoneae sp. nov.* from the lower Malay Peninsula. *A. shireenae sp. nov.* is separated from *A. lynnejohnstoneae sp. nov.* by several characters including a lack of melanism on the dorsal surface of the head (see in *A. lynnejohnstoneae sp. nov.*) and a lack of the profuse blackish specking seen on the dorsal surface of *A. lynnejohnstoneae sp. nov.*.

The top of the head of *A. shireenae sp. nov.*, while also reddish brown in colour has two distinct white patches somewhat anterior to the eyes, pointing towards the middle of the head, but not meeting. The iris is brownish in colour and characterised by the presence of whitish specks.

Aplopeltura boa (Boie, 1828) from Java is readily separated from others in the genus (as defined herein) by significant somewhat irregular shaped white patches along the dorsal midline. The dark patch below the eye that commences on the jawline, does not extend as far as the eye or if so, only just intersects it.

Aplopeltura omarelhelou sp. nov. from southern Thailand on the Isthumus of Kra in the region generally north of and including Songkhla and Trang are readily separated from those on the lower Malay Peninsula (*A. lynnejohnstoneae sp. nov.*) and all other species of *Aplopeltura* by the well defined whitish etchings on the rear margins of otherwise darker labials.
A. omarelhelou sp. nov. are also separated from the other species by the obvious dark purplish red markings on the head and dorsal surface.

White markings in the form of irregular shaped, but vaguely triangular blotches are very distinct and well defined in *A. omarelhelou sp. nov.*, as opposed to being either moderately well-defined or poorly defined in all other species.
Aplopeltura daranini sp. nov. from Sumatra is readily separated from all other species of *Aplopeltura* by being similar in most respects to *A. lynnejohnstoneae sp. nov.* as defined above, but by the following obvious differences. It has an orange sheen or peppering over the white upper labials so that they do not appear to be an immaculate white in colour, as well as the markings of the iris. In *A. lynnejohnstoneae sp. nov.* the iris is more-or-less of one colour being a brownish colour, wheras in *A. daranini sp. nov.* the iris is generally whitish in colour, but with darker reddish veins or markings running more-or-less radially out from the centre. On *A. daranini sp. nov.* the indistinct dorsal pattern is defined by the presence of irregular black spots as opposed to smaller blackish flecks as seen in *A. lynnejohnstoneae sp. nov.*.

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reasonably distinct dorsal pattern consisting of irregular markings or blotches on the dorsal surface, the most obvious ones being an orangeish red in colour. The white markings on the lower flanks and white parts of the upper labials are heavily peppered making them appear to be off-white and a shade of the peppering, or alternatively fully shaded as another colour anyway (e.g. yellow). The dark patch under the eye is also well-broken by one or more streaks of white pigment, this also being well peppered or shaded by a colour such as yellow, orange or red.

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The maxillary bone is very short, deep and with 5 or 6 subequal mandibular teeth gradually decreasing in length. The head is distinct from the neck; eye moderate, with a vertical pupil; nasal single. Body more or less compressed; scales smooth or feebly keeled, without pits, more or less oblique, in 13-15 rows, vertebral row may be enlarged or not (depending on the genus). Ventrals rounded. Tail moderate or short; subcaudals divided.

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Aplopeltura has 26-55 single subcaudals, versus 88-120 divided subcaudals in *Asthenodipsas* as well as numerous other differences at outlined by Boulenger (1896) in his species-level descriptions.

Distribution: Lower Peninsula Malaysia in a region generally south of Songkhla and Trang, southern Thailand (not including those two named areas).

Etymology: Named in honour of Lynne Johnstone in recognition of her contributions to Australian culture via her long term relationship with lifetime partner Bruce Rogers, of Bend of Islands, Kangaroo Ground, Victoria, Australia, one of the worlds foremost Didgeridoo players and makers, who has been hailed as a hero for Indigenous Australians, even though he was not born as one. In 2015, Bruce Rogers was diagnosed with an aggressive terminal cancer, (Leukemia), and died in July 2016.
Brucerogersus Hoser, 2012 (type species *Eutaenia chrysocephala* Cope, 1885) is a genus of North American Garter Snakes named in honour of Bruce Rogers.

APLOPELTURA DARANINI SP. NOV.

Holotype: A preserved specimen at the American Museum of Natural History, New York, USA, specimen number: AMNH Herpetology R-2886 collected from Sumatra, Indonesia.

This is a facility that allows access to its holdings.

Diagnosis: *Aplopeltura daranini sp. nov.* from Sumatra is readily separated from all other species of *Aplopeltura* by being similar in most respects to *A. lynnejohnstoneae sp. nov.* (as defined in the description preceding or within this one, below), but by the following obvious differences. It has an orange sheen or peppering over the white upper labials so that they do not appear to be an immaculate white in colour, as well as the markings of the iris. In *A. lynnejohnstoneae sp. nov.* the iris is more-or-less of one colour being a brownish colour, wheras in *A. daranini sp. nov.* the iris is generally whitish in colour, but with darker reddish veins or markings running more-or-less radially out from the centre. On *A. daranini sp. nov.* the indistinct dorsal pattern is defined by the presence of irregular black spots as opposed to smaller blackish flecks as seen in *A. lynnejohnstoneae sp. nov.*.

Aplopeltura lynnejohnstoneae sp. nov. from the lower Malay Peninsula are readily separated from all other species of *Aplopeltura* by having significant melanism on the upper surface of the head, very white upper labials, the white lacking any darker pigment, sheen or flecks as seen in all other species, this being except for a small triangular dark patch under the eye (such a dark patch in one form or other is seen in all species), but which is far narrower than the eye itself in this species, and an indistinct dorsal pattern also defined by the presence of numerous irregular black or blackish flecks throughout.

Aplopeltura shireenae sp. nov. from the main Philippine Islands, including Mindanao, are readily separated from all other *Aplopeltura* species by the following suite of characters: A generally very indistinct dorsal pattern, being a light reddish-brown in colour, the lateral white blotches rising from the belly on the lower flanks are so heavily shaded that they are barely noticeable and this includes for the anterior section of the body, which is only similarly seen in *Aplopeltura lynnejohnstoneae sp. nov.* from the lower Malay Peninsula. *A. shireenae sp. nov.* is separated from *A. lynnejohnstoneae sp. nov.* by several characters including a lack of melanism on the dorsal surface of the head (see in *A. lynnejohnstoneae sp. nov.*) and a lack of the profuse blackish specking seen on the dorsal surface of *A. lynnejohnstoneae sp. nov.*.

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They have short skulls; relatively large eyes; a large nasal gland; have a relatively low number of scales at mid body (13-15 rows); the chin shields have no midline groove, and extend across the chin; they are nocturnal; they feed mostly upon gastropods and small vertebrates; and they lay eggs.

The maxillary bone is very short, deep and with 5 or 6 subequal mandibular teeth gradually decreasing in length. The head is distinct from the neck; eye moderate, with a vertical pupil; nasal single. Body more or less compressed; scales smooth or feebly keeled, without pits, more or less oblique, in 13-15 rows, vertebral row may be enlarged or not (depending on the genus). Ventrals rounded. Tail moderate or short; subcaudals divided.

Observations on captive and wild snakes eating snails suggests that they rest the upper jaw on a snail (preferred food) and use the mandibles to pull the snail's body out of its shell. These are thought to represent a basal lineage of the advanced snakes (Caenophidia).

There are 4 recognized genera and about 15 species currently recognized (before the publication of this paper), all inhabiting Southeast Asia.

Genus *Aplopeltura* Duméril, 1838 has until now been treated as being monotypic for the species *A. boa* (Boie, 1828), but split six ways in this paper, with five new species formally named.

Snakes in the genera *Aplopeltura* Duméril, 1838 and *Asthenodipsas* Peters, 1864 are considerably thinner in build and show significant vertical compression (also seen as a distinct midline ridge along the back), that is not seen in *Pareas* Wagler, 1830 or *Katrinahoserserpenea* Hoser, 2012 as recognized to date.

Aplopeltura has 26-55 single subcaudals, versus 88-120 divided subcaudals in *Asthenodipsas* as well as numerous other differences at outlined by Boulenger (1896) in his species-level descriptions.

Distribution: Known only from the hillier sections of the island of Sumatra, Indonesia and mainly in the north.

Etymology: Named in honour of Dara Nin of Ringwood, Victoria, Australia in recognition of a decade's valuable wildlife conservation and education work with Snakebusters: Australia's best reptile displays, being the only wildlife display in Australia that lets people hold the animals, as opposed to boring static displays done by less experienced imitators, this being the sworn evidence of Ronald Leslie Waters, a former head of wildlife law enforcement at the Department of Sustainability and Environment in Victoria (AKA DSE), in a court of law in 2015 (VCAT 2015).

APLOPELTURA GIBBONSI SP. NOV.

Holotype: A preserved specimen at the Field Museum of Natural History, Chicago, Illinois, USA, specimen number: FMNH Amphibians and Reptiles 246150, collected at Sabah, Borneo, Malaysia.

The Field Museum of Natural History, Chicago, Illinois, USA, allows access to its holdings.

Paratypes: Three preserved specimens at the Field Museum of Natural History, Chicago, Illinois, USA, specimen numbers: FMNH Amphibians and Reptiles 246149, 246146 and 246151, collected at Sabah, Borneo, Malaysia.

Diagnosis: *Aplopeltura gibbonsi sp. nov.* from Borneo is separated from all other *Aplopeltura* species by the following suite of characters: Having a reasonably distinct dorsal pattern consisting of irregular markings or blotches on the dorsal surface, the most obvious ones being an orangeish red in colour. The white markings on the lower flanks and white parts of the upper labials are heavily peppered making them appear to be off-white and a shade of the peppering, or alternatively fully shaded as another colour anyway (e.g. yellow). The dark patch under the eye is also well-broken by one or more streaks of white pigment, this also being well peppered or shaded by a colour such as yellow, orange or red.

Aplopeltura lynnejohnstoneae sp. nov. from the lower Malay Peninsula are readily separated from all other species of *Aplopeltura* by having significant melanism on the upper surface of the head, very white upper labials, the white lacking any darker pigment, sheen or flecks as seen in all other species, this being except for a small triangular dark patch under the eye (such a dark patch in one form or other is seen in all species), but which is far narrower than the eye itself in this species, and an indistinct dorsal pattern also defined by the presence of numerous irregular black or blackish flecks throughout.

Aplopeltura shireenae sp. nov. from the main Philippine Islands, including Mindanao, are readily separated from all other *Aplopeltura* species by the following suite of characters: A generally very indistinct dorsal pattern, being a light reddish-brown in colour, the lateral white blotches rising from the belly on the lower flanks are so heavily shaded that they are barely noticeable and this includes for the anterior section of the body, which is only similarly seen in *Aplopeltura lynnejohnstoneae sp. nov.* from the lower Malay Peninsula. *A. shireenae sp. nov.* is separated from *A. lynnejohnstoneae sp. nov.* by several characters including a lack of melanism on the dorsal surface of the head (see in *A. lynnejohnstoneae sp. nov.*) and a lack of the profuse blackish specking seen on the dorsal surface of *A. lynnejohnstoneae sp. nov.*.

The top of the head of *A. shireenae sp. nov.*, while also reddish brown in colour has two distinct white patches somewhat anterior to the eyes, pointing towards the middle of the head, but not meeting. The iris is brownish in colour and characterised by the presence of whitish specks.

Aplopeltura boa (Boie, 1828) from Java is readily separated from others in the genus (as defined herein) by significant somewhat irregular shaped white patches along the dorsal midline. The dark patch below the eye that commences on the jawline, does not extend as far as the eye or if so, only just intersects it.

Aplopeltura omarelhelou sp. nov. from southern Thailand on the Isthumus of Kra in the region generally north of and including Songkhla and Trang are readily separated from those on the lower Malay Peninsula (*A. lynnejohnstoneae sp. nov.*) and all other species of *Aplopeltura* by the well defined whitish etchings on the rear margins of otherwise darker labials.
A. omarelhelou sp. nov. are also separated from the other species by the obvious dark purplish red markings on the head and dorsal surface.

White markings in the form of irregular shaped, but vaguely triangular blotches are very distinct and well defined in *A. omarelhelou sp. nov.*, as opposed to being either moderately well-defined or poorly defined in all other species.
Aplopeltura daranini sp. nov. from Sumatra is readily separated from all other species of *Aplopeltura* by being similar in most respects to *A. lynnejohnstoneae sp. nov.* as defined above, but by the following obvious differences. It has an orange sheen or peppering over the white upper labials so that they do not appear to be an immaculate white in colour, as well as the markings of the iris. In *A. lynnejohnstoneae sp. nov.* the iris is more-or-less of one colour being a brownish colour, wheras in *A. daranini sp. nov.* the iris is generally whitish in colour, but with darker reddish veins or markings running more-or-less radially out from the centre. On *A. daranini sp. nov.* the indistinct dorsal pattern is defined by the presence of irregular black spots as opposed to smaller blackish flecks as seen in *A. lynnejohnstoneae sp. nov.*.

Members of the family Pareidae (alternatively referred to as the

Hoser 2016 - Australasian Journal of Herpetology 33:42-51.

Pareatidae) are unique among Southeast Asian snakes and diagnosed in having large scales overlapping on their chins rather than having them separated by a straight groove. These snakes are known to feed mainly on terrestrial molluscs.

They have short skulls; relatively large eyes; a large nasal gland; have a relatively low number of scales at mid body (13-15 rows); the chin shields have no midline groove, and extend across the chin; they are nocturnal; they feed mostly upon gastropods and small vertebrates; and they lay eggs.

The maxillary bone is very short, deep and with 5 or 6 subequal mandibular teeth gradually decreasing in length. The head is distinct from the neck; eye moderate, with a vertical pupil; nasal single. Body more or less compressed; scales smooth or feebly keeled, without pits, more or less oblique, in 13-15 rows, vertebral row may be enlarged or not (depending on the genus). Ventrals rounded. Tail moderate or short; subcaudals divided.

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Snakes in the genera *Aplopeltura* Duméril, 1838 and *Asthenodipsas* Peters, 1864 are considerably thinner in build and show significant vertical compression (also seen as a distinct midline ridge along the back), that is not seen in *Pareas* Wagler, 1830 or *Katrinahoserserpenea* Hoser, 2012 as recognized to date.

Aplopeltura has 26-55 single subcaudals, versus 88-120 divided subcaudals in *Asthenodipsas* as well as numerous other differences at outlined by Boulenger (1896) in his species-level descriptions.

Distribution: The island of Borneo, Malaysia, Brunei and Indonesia, mainly in the hiller parts of the north and immediately adjacent areas.

Etymology: Named in honour of Dale Gibbons of Maiden Gully, on the outskirts of Bendigo, Victoria, Australia in recognition of a lifetime's work with wildlife conservation and herpetology, including captive breeding of rare and threatened species as well as a significant contribution to field work and surveys throughout the Australian state of Victoria.

PAREAS CARINATUS SUMATRENSIS SUBSP. NOV.

Holotype: A preserved specimen at the Museum of Comparative Zoology, Harvard University in Cambridge, Massachusetts, USA, specimen number: MCZ:Herp:R-37764, collected at Langhat, north-east coast of Sumatra, Indonesia, Latitude 3.98,, Longitude 98.48.

The Museum of Comparative Zoology, Harvard University in Cambridge, Massachusetts, USA, allows access to its holdings.

Paratype: A preserved specimen at the National Museum of Natural History (USA), formerly known as the US National Museum, administered by the Smithsonian Institution, Washington, D.C., USA, specimen number: USNM 103582.6076586, collected from Utara, Sumatra, Indonesia.

Diagnosis: *Pareas carinatus sumatrensis sp. nov.* from Sumatra is readily separated from all other subspecies by the presence of extensive peppering on the light upper labials and head. The same peppering extends along the upper forebody.

Nominate *P. carinatus carinatus* from Java and islands east of there, are separated from the other subspecies by a temporal streak on each side, merging to form a short thick black band on the back of the head and neck, which at the posterior end extends down the flanks to immediately above the ventrals. In line with the other subspecies, the dorsal pattern beyond this point is one of alternating semi-destinct blackish crossbands intersperced with wider areas of dark brown or greyish brown.

On the forebody of *P. carinatus sumatrensis subsp. nov.* from Sumatra, the lighter dorsal crossbands are significantly wider than the darker ones, versus the reverse situation (or roughly equal size) as seen in nominate *P. carinatus carinatus* from Java, or those from Peninsula Malaysia, herein named as *P. carinatus malayensis subsp. nov.*.

P. carinatus nuchalis (Boulenger, 1890) from Borneo, are readily distinguished from the other subspecies by the obvious melanism (blackish colouration) of the head and neck, meaning the temporal streak is either hidden or not obvious, the fact that the dark blackish bands are distinct and extend quite clearly down the flanks to the ventral surface, and usually have individual white scales on the spine at the forebody being noticeably lighter in colour, forming a semi-distinct dotted vertebral stripe.

P. carinatus unicolor Bourret, 1934 from Cambodia are separated from the other subspecies by the fact that the darker crossbands are significantly obscured on the mid flanks being near absent at this point. The mid and rear upper labials are also characterised by dark etching (usually dark brown) on the scale margins.

There is also an unsual unicolour phase in the range for *P. carinatus unicolor* Bourret, 1934, not seen elsewhere.
P. carinatus malayensis subsp. nov.. from Peninsula Malaysia and nearby places further north are similar in most respects to *P. carinatus carinatus* but are separated from that subspecies by the absence of the temporal streak on each side merging to form a short thick black band on the back of the head and neck, which at the posterior end extends down the flanks to immediately above the ventrals.

P. carinatus malayensis subsp. nov.. are further separated from the other subspecies by either the absence of a well defined temporal streak, or alternatively one that is relatively indistinct.

Snakes of the genus *Pareas* as presently recognized consists of (about) just one species as defined herein and are diagnosed by being small and slender with a blunt snout, no mental groove and no teeth on the anterior part of the maxillary.

Snakes in the genera *Aplobeltura* Duméril, 1853 and *Asthenodipsas* Peters, 1864 are considerably thinner in build and more vertically compressed than seen in *Pareas* and *Katrinahoserserpenea* Hoser, 2013 as recognized to date.

Pareas has since 2012 been restricted to the species taxa *P. carinatus* and putative *P. nuchalis*, treated here as a subspecies of one another, along with the other forms identified herein.

Those taxa differ from taxa in the genus *Katrinahoserserpenea* by cephalic scalation and distribution pattern.

P. carinatus sensu lato (including putative *P. nuchalis* and other forms identified above) share three anterior temporals in contrast to the one or two (rarely three) anterior temporals in *Katrinahoserserpenea* species.

The frontal scale in *P. carinatus sensu lato* (including putative *P. nuchalis* and other forms identified above) is hexagonal with the lateral sides parallel to the body axis; this scale in *Katrinahoserserpenea* is almost diamond-shaped or shield-shaped with the lateral sides converging posteriorly.

The two anterior chin shields are longer than broad in *Katrinahoserserpenea*, whereas in *Pareas* they are broader than long; this is a consistent way to separate the two genera.

The snakes remaining in the genus *Pareas* occur mainly throughout the Indochinese Peninsula and Sunda Islands. By contrast most species of *Katrinahoserserpenea* occur in central and southern China and the northern Indochinese Peninsula, with only two species, *Katrinahoserserpenea margaritophorus* and *K. hamptoni* being found in the southern Indochinese Peninsula.

Distribution: Hillier parts of Sumatra, Indonesia and nearby areas, including most of the northern quarter of the island and the hills and mountains running along the western side of the island.

Etymology: Named in reflection of where they naturally occur.

PAREAS CARINATUS MALAYENSIS SUBSP. NOV.

Holotype: A preserved specimen at the California Academy of Science, San Francisco, USA, specimen number: CAS:HERP:73696, collected at Patani, southern Thailand.

The California Academy of Science, USA allows access to its holdings

Diagnosis: *P. carinatus malayensis subsp. nov..* from Peninsula Malaysia are similar in most respects to *P. carinatus carinatus* (see below) but are separated from that subspecies by the absence of the temporal streak on each side merging to form a short thick black band on the back of the head and neck, which at the posterior end extends down the flanks to immediately above the ventrals.

P. carinatus malayensis subsp. nov.. are further separated from the other subspecies by either the absence of a well defined temporal streak, or alternatively one that is relatively indistinct.

Nominate *P. carinatus carinatus* from Java and islands east of there are separated from the other subspecies by a temporal streak on each side, merging to form a short thick black band on the back of the head and neck, which at the posterior end extends down the flanks to immediately above the ventrals. In line with the other subspecies, the dorsal pattern beyond this point is one of alternating semi-destinct blackish crossbands intersperced with wider areas of dark brown or greyish brown.

On the forebody of *P. carinatus sumatrensis subsp. nov*. from Sumatra, the lighter dorsal crossbands are significantly wider than the darker ones, versus the reverse situation (or roughly equal size) as seen in nominate *P. carinatus carinatus* from Java, or those from Peninsula Malaysia, herein named as *P. carinatus malayensis subsp. nov..*

Pareas carinatus sumatrensis sp. nov. is readily separated from all other subspecies by the presence of extensive peppering on the light upper labials and head. The same peppering extends along the upper forebody.

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There is also an unsual unicolour phase in the range for *P. carinatus unicolor* Bourret, 1934, not seen elsewhere.
Snakes of the genus *Pareas* as presently recognized consists of about just one species as defined herein and are diagnosed by being small and slender with a blunt snout, no mental groove and no teeth on the anterior part of the maxillary.

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Finally I note that *P. carinatus malayensis subsp. nov.* is a legally available name under the rules of the the *International Code of Zoological Nomenclature* (Ride *et al*. 1999). The name *Malayopython* Reynolds *et al.* (2013a, b and 2014) is not!

See Hoser (2015) for the details.

Distribution: The lower Malay Peninsula, Asia, extending north along most of the Isthumus of Kra.

Etymology: Named in reflection of where they naturally occur.

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CONFLICT OF INTEREST

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

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A new species of *Litotescincus* Wells and Wellington, 1985 from south-west Tasmania.

RAYMOND T. HOSER

488 Park Road, Park Orchards, Victoria, 3134, Australia.
***Phone*: +61 3 9812 3322 *Fax*: 9812 3355 *E-mail*: snakeman (at) snakeman.com.au**
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ABSTRACT

The genus name *Litotescincus* Wells and Wellington, 1985, type species *Mocoa metallica* O'Shaughnessy, 1874 has been effectively unused in herpetology since it was coined by the original authors. However recent phylogenetic studies including that of Pyron *et al.* (2013) have effectively validated the placement of the species group into its own genus (apart from all other available names) and so the name is used here.

A population of skinks until now treated as a regional variant of the widespread species *L. metallica* (O'Shaughnessy, 1874), from southern Tasmania is herein described as a new species *L. wellsi sp. nov.*.

It is named in recognition of the perceptive contributions to herpetology by the lead author of Wells and Wellington (1985), namely Richard Wells.

Significantly in their 1985 paper Wells and Wellington wrote of the species *L. metallica*: "Herein regarded as a complex of a number of undescribed species".

This paper effectively confirms that view.

Keywords: Taxonomy; Nomenclature; Skinks; Tasmania; Australia; genus; *Litotescincus*; *Carinascincus*; synonym; invalid genus; *Niveoscincus*; taxonomic vandalism; thieves; species; *metallica*; *wellsi.*

INTRODUCTION

The genus name *Litotescincus* Wells and Wellington, 1985, type species *Mocoa metallica* O'Shaughnessy, 1874 has been effectively unused in herpetology since it was coined by the original authors.

At the same time, the same authors proposed hundreds of names for various species and genera in Australia and New Zealand and history has shown their judgements to be mainly correct.

This includes as seen in the major work of Cogger (2014), which is littered with Wells and Wellington "names" throughout the book's over 1000 pages.

The three major works by Wells and Wellington in the period 1983-1985, including that which coined the name *Litotescincus*, were the subject of an attempted suppression by a band of thieves intent on stealing the "name authority" for the hundreds of species and genera formally named by the two men in these works. This history was outlined by the ICZN in their final decision of 1991 (see anonymous 1988 and ICZN 1991).

A second similar attempt by Robert Sprackland to steal "name authority" for the taxon described as "*Odatria keithhornei* Wells and Wellington, 1985" failed (ICZN 2001). Sprackland had attempted to name the same species after his wife, even though he knew he was engaging in a highly illegal act of taxonomic vandalism.

"Name authority" for taxa is legally owned intellectual property and cannot be stolen or misappropriated and this was made known to the ICZN in a submission in the 1980's (see Hoser 2015a-f and sources cited therein).

The relevant species is now known as *Shireenhosersaurea keithhornei* (Wells and Wellington, 1985), as defined by Hoser (2013).

More recent campaigns by the same band of thieves to steal "name authority" from myself (Hoser), and Wells again are outlined by ICZN (2000) and Hoser (2015a-f, including sources cited therein).

Recent phylogenetic studies including that of Pyron *et al.* (2013) have effectively validated the placement of the species group *Litotescincus* Wells and Wellington, 1985, type species *Mocoa metallica* O'Shaughnessy, 1874 as conceived by Wells and Wellington into its own genus and so the name *Litotescincus* is used here, being the only correct available name for the species group.

The genus name *Carinascincus* Wells and Wellington, 1985, type species *Leiolopisma greeni* Rawlinson, 1975 has been applied to the *Mocoa metallica* O'Shaughnessy, 1874 species group by many authors in the period since 1991, including the conservative Hal Cogger in Cogger (2014).

However on the basis of the morphological differences between the relevant type species and the published molecular results of Pyron *et al.* (2013), it is self evident that in time *Litotescincus* will be the properly applied genus name to the relevant species group.

In 1990 and in a foolish anticipation of an illegal ICZN ruling

against the works of Wells and Wellington, Hutchinson *et al.* (1990) unlawfully coined the name *Niveoscincus* (with the same type species as *Carinascincus*) in order to scoop "name authority" from others.

The name was widely used for a short time including in some of the references cited, but as it is an illegal junior synonym, with no potential for proper useage under the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999), it is no longer used by professional herpetologists anywhere.

Mention is made of the band of thieves known as the Wüster gang, as detailed by Hoser (2015a-f) and sources cited therein, who continue to illegally coin and use names in order to try to improperly steal name authority from other authors, including Wells and Wellington. On a site they control, called "Reptile Database" ostensibly managed by one Peter Uetz, as recently as early 2016, when this paper was being finalized, the illegal name *Niveoscincus* was being touted as the correct name for the genus *Carinascincus* (Uetz 2016a).

To justify his illegal actions, Uetz, claimed to be operating under the auspices of a so-called "Scientific Advisory Board" that he had allegedly appointed (Uetz 2016b). However the membership list is in the main part the band of thieves and "non-scientists" comprising the Wüster gang, with such names as the criminal Mark O'Shea from the UK, Wüster himself (from Wales) and another well-known thief by the name of Steven Blair Hedges (Uetz 2016a, 2016b).

Hence they are using the Uetz site to foist their illegal brand of nomenclature and fictional taxonomy, including for example the various imagined *Leiopython* species invented by Wulf Schleip in 2008 (Schleip 2008, as detailed by Hoser 2009) on the rest of the world, trying to portray the site as some kind of "official" scientific portal.

Mention is made of all these antics in this paper because as a result of the highly illegal extreme taxonomic and nomenclatural vandalism of the Wüster gang, it is likely that people will continue to see the unlawful name *Niveoscincus* applied to the species discussed within this paper, including for example in some of the otherwise very useful references cited herein.

As part of an audit of skinks assumed to be within the species *L. metallica* I determined that a population from the far south-west of Tasmania, treated until now as a variant of *L. metallica*, was in fact a very different species.

This population of skinks until now treated as a regional variant of the widespread species *L. metallica* (O'Shaughnessy, 1874), from southern Tasmania is herein described as a new species *L. wellsi sp. nov.*.

It is named in recognition of the perceptive contributions to herpetology by the lead author of Wells and Wellington (1985), namely Richard Wells.

Significantly in their 1985 paper Wells and Wellington wrote of the species *L. metallica*: "Herein regarded as a complex of a number of undescribed species".

This paper effectively confirms that view.

Significant data in relation to this species and other so-called variants of *L. metallica*, including those from southern Victoria was seized in an illegal armed raid on our facility on 17 August 2011 (Court of Appeal Victoria 2014, VCAT 2015). In spite of court orders to return all stolen goods, much was not and that which was came back was generally irreparably damaged. It isn't necessary to detail other violent illegal acts committed during the armede raid, such as shoving guns in the faces of vulnerable young children, killing of supposedly protected native fauna, to wit snakes, all filmed by the government wildlife officers themselves as they committed their crimes, most of which was later played back to them in a court of law.
What is significant is that the theft of this material delayed the publication of this paper indefinitely. However I have decided that five years hence, the conservation imperative to formally name undescribed taxa outweighs any defects caused by less data being available at the time of publication. Hence this paper is published now.

Published literature relevant to the species *L. metallica* and *L. wellsi sp. nov*. as described herein include the following: Brongersma (1942), Chapple and Swain (2004), Cogger (2014), Gray (1845), Greer (1982), Hurtchinson and Schwaner (1991), Hutchinson *et al.* (2001), Melville and Swain (2000a, 2000b), O'Shaughnessy (1874), Rawlinson (1975), Wells and Wellington (1983, 1985), Wilson and Swan (2010), Wu *et al.* (2014) and sources cited therein.

LITOTESCINCUS WELLSI SP. NOV.

Holotype: A preserved specimen at the National Museum of Victoria, Melbourne, Australia, Museum Victoria Herpetology Collection, Catalogue number D62303, collected from New Harbour, South-west Tasmania, Australia, Latitude -43.52, Longitude 146.17.

The National Museum of Victoria, Melbourne, Australia is a government-owned facility that allows access to its holdings.

Diagnosis: *Litotescincus wellsi sp. nov*. is similar in most respects to *L. metallica*, the species it was previously treated as. However it is readily separated from that species by colouration. This species is characterised by being heavily striped (unlike *L. metallica*) and lacks significant dorsal or lateral speckling found on typical *L. metallica.* Furthermore *Litotescincus wellsi sp. nov*. have strongly keeled scales, not seen in *L. metallica.*

Diagnostic characters for separation of *L. wellsi sp. nov.* and *L. metallica* (treated as the same species) from all other *Litotescincus* and *Carinascincus*, all treated as *Carinascincus* is in Cogger (2014).

Distribution: Far south-west Tasmania only.

Etymology: The species is named in recognition of the perceptive contributions to herpetology by the lead author of Wells and Wellington (1985), namely Richard Wells, now currently resident of near Lismore, northern New South Wales, Australia.

NOTES ON THIS DESCRIPTION FOR ANY POTENTIAL REVISORS

Unless mandated by the rules of the *International Code of Zoological Nomenclature*, the spelling of the newly proposed name should not be altered in any way.

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CONFLICT OF INTEREST

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

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Two new species of frogs in the genus *Adelotus* Ogilby, 1907 from Queensland Australia (Anura: Limnodynastidae).

RAYMOND T. HOSER

488 Park Road, Park Orchards, Victoria, 3134, Australia.
***Phone*: +61 3 9812 3322 *Fax*: 9812 3355 *E-mail*: snakeman (at) snakeman.com.au**
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ABSTRACT

The divergent genus *Adelotus* Ogilby, 1907 has until now been recognized by all herpetologists as consisting just one species. The relatively non-descript small brown frog known as *Adelotus brevis* (Günther, 1863) otherwise known as the Tusked Frog, is a common species found from the central coast of New South Wales, through wetter areas to south-east Queensland. Outlier populations are found in relictual areas of wet forests and hilly wet forests away from the coast in South-east Queensland and also near the coast in mid north Queensland, near Mackay and Townsville.

Inspection of specimens from two locations (namely Canarvon Gorge, National Park) and Eungella in Queensland shows that the specimens differ significantly in morphology from the geographically separated type race and they are herein described as two separate species in accordance with the *International Code of Zoological Nomenclature*, current, in force edition (Ride *et al*. 1999).

Keywords: Taxonomy; frogs; Anura; Limnodynastidae; genus *Adelotus*; species; *brevis*; Queensland; New South Wales; Australia; Canarvon Gorge; Eungella; Mackay; new species; *griffithsi*; *valentici.*

INTRODUCTION

The divergent genus *Adelotus* Ogilby, 1907 has until now been recognized by all herpetologists as consisting just one species.

This is seen for example in the major publications of Cogger *et al*. (1983), Wells and Wellington (1985) and more recently that of Cogger (2014).

The relatively non-descript small brown frog known as *Adelotus brevis* (Günther, 1863) otherwise known as the Tusked Frog, is a common species found from the central coast of New South Wales, through wetter areas to south-east Queensland. Outlier populations are found in relictual areas of wet forests and hilly wet forests away from the coast in South-east Queensland and also near the coast in mid north Queensland, near Mackay and Townsville.

Notwithstanding the fact that the species (as recognized) is found in areas with species that are larger and "more interesting" to herpetologists, the neglect by taxomomists of the species (or species complex as asserted herein) is surprising considering the publication of a significant paper by Ken Griffiths in 2001. That paper, cited herein as:

Griffiths, K. 2001. Observations of unusual *Adelotus* in the Carnarvan Ranges, Queensland. *Herpetofauna*, 31(2):97-98,

gave in effect a detailed description of what was clearly a new and distinct specis of *Adelotus* from the Canarvon Ranges National Park in Queensland.

Had he named a holotype, (he cited a candidate animal in the Queensland Museum) and had he published the paper as a description with a new name in accordance with the provisions of the *International Code of Zoological Nomenclature* (Ride *et al*. 1999), he would have published a very good description of the said taxon, albiet with a few relatively minor mistakes that could be easily corrected by later authors.

At the time I read the paper, my sentiments were exactly as surmised above and in view of the provisons of the *International Code of Zoological Nomenclature* that effectively states that persons with a stated interest in a new and unnamed taxon should have priority in rights to name it, I did not seek to describe the taxon on the assumption someone else would.

Since then, published accounts of *Adelotus*, including for example Cogger (2014) have continued to refer to this outlier population as *Adelotus brevis* and some 15 years have elapsed and the taxon remains unnamed!

In order to correct this anomaly, the unnamed taxon from the Canarvon Ranges National Park in Queensland is herein named *Adelotus griffithsi sp. nov*. in recognition of the work he did in compiling his 2001 paper cited herein, which in turn assisted in directing me to inspect further specimens of the relevant taxa, noting I have been working with these animals since the 1970's.

Specimens from the Mackay/Eungella region were also inspected and found to be significantly different from those of the nominate form found further south (in NSW), and so they too are named as a new species in accordance with the rules of the *International Code of Zoological Nomenclature.*

That taxon is named *Adelotus valentici sp. nov.* in honour of Robert Valentic of Donnybrook, Victoria in recognition of more than two decades of excellent intensive herpetological fieldwork across Australia and more recently in south-east Asia, best encapsulated in the many high class photographs he has

produced and published, which are readily found by search of the internet and are of use to scientists such as myself.

ADELOTUS GRIFFITHSI SP. NOV.

Holotype: A preserved specimen, specimen number J86019 at the Queensland Museum, Brisbane, Queensland, Australia collected at Canarvon Gorge National Park, Queensland, Australia. (The specimen has a second number of 1312814).

The Queensland Museum is a government owned facility that allows access to its holdings.

Paratype: A preserved specimen, specimen number J16269 at the Queensland Museum, Brisbane, Queensland, Australia collected at Canarvon Gorge National Park, Queensland, Australia.

Diagnosis: In contrast with the nominate form, the species *A. griffithsi sp. nov.* has a venter in both sexes that is generally an opaque off-white in colour with well defined tiny white flecks, which sometimes merge to form small blotches. The dark grey venter with large white blotches, splotches or marbling as seen in the nominate form from northern NSW and southern Queensland in both sexes is not seen in *A. griffithsi sp. nov.*.
Griffiths (2001) noted an absence of the "red colouration on the backs of the legs and groin region which is typical of Adelotus brevis in New South Wales", (the non-italicized name a typographical error in that paper) but (obviously unknown to Griffiths in 2001), this red colouration is in fact seen in females of *A. griffithsi sp. nov.*.
However other comments by Griffiths (2001) relating to differences in colour between the taxa are in fact correct.

The red flashes on the back of the hind legs and groin region is orange in *Adelotus griffithsi sp. nov.*.

Adelotus valentici sp. nov. are separated from the other two species by a grayish-white venter characterised with numerous white flecks, and orange flecks under the forebody. There is a semi-distinct whitish line along the labial line (the mouth), not seen in the other species. The red flashes on the back of the hind legs and groin region is orange in *Adelotus valentici sp. nov.*.
Cogger (2014) gives a detailed diagnosis of the genus *Adelotus* and how it is separated from all other genera of frogs in Australia.

Distribution: Known only from the Canarvon Gorge National Park in south-east Queensland, Australia.

Etymology: Named in honour of Sydney based reptile enthusiast Ken Griffiths, not only in recognition of his 2001 paper on *Adelotus*, but also of his other work in producing mass-market books on the identification of Sydney's reptiles.

ADELOTUS VALENTICI SP. NOV.

Holotype: A preserved specimen, specimen number J59473 at the Queensland Museum, Brisbane, Queensland, Australia collected at Broken River, Eungella, Queensland, Australia. (The specimen has a second number of 1877541).

The Queensland Museum is a government owned facility that allows access to its holdings.

Paratype: A preserved specimen, specimen number J53387 at the Queensland Museum, Brisbane, Queensland, Australia collected at Rocky Dam Ck, via Crediton (near Mackay, NQ), Queensland, Australia. (The specimen has a second number of1977757).

Diagnosis: *Adelotus valentici sp. nov.* are separated from the other two species by a grayish-white venter characterised with numerous white flecks, and orange flecks under the forebody. There is a semi-distinct whitish line along the labial line (the mouth), not seen in the other species, which have dark bands, blotches and the like running to the labial line of the mouth. The red flashes on the back of the hind legs and groin region is orange in *Adelotus valentici sp. nov.*.

In contrast with the nominate form, the species *A. griffithsi sp. nov.* from the Canarvon Ranges National Park in Queensland, has a venter in both sexes that is generally an opaque off-white in colour with well defined tiny white flecks, which sometimes merge to form small blotches. The dark grey venter with large white blotches, splotches or marbling as seen in the nominate form from northern NSW and southern Queensland in both sexes is not seen in *A. griffithsi sp. nov.*.
Griffiths (2001) noted an absence of the "red colouration on the backs of the legs and groin region which is typical of Adelotus brevis in New South Wales", (the non-italicized name a typographical error in that paper) but (obviously unknown to Griffiths in 2001), this red colouration is in fact sometimes seen in females of *A. griffithsi sp. nov.*.
However other comments by Griffiths (2001) relating to differences in venter colour between the taxa are in fact correct and diagnostic of the two forms in terms of separating them.

The red flashes on the back of the hind legs and groin region is orange in *Adelotus griffithsi sp. nov.* as opposed to red.

Nominate *A. brevis* are characterised by significantly darker base colour of the throat and venter (dark grey to black), than seen in the other two newly described species of *Adelotus*.

Cogger (2014) gives a diagnosis of the genus *Adelotus* and how it is separated from all other genera of frogs in Australia.

Distribution: Known only from the Mackay area, lower north Queensland coast, Australia.

Etymology: Named in honour of Robert Valentic of Donnybrook, Victoria, Australia, in recognition of a lifetime's work in the field collecting and studying reptiles, including many lesser known forms, across most parts of Australia and also various places outside Australia.

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The author has no known relevant conflicts of interest.

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A redefinition of the Australian frog genus *Platyplectrum* Günther, 1863, dividing the genus into two and including the description of two new species from mid Western Australia and far North Queensland.

RAYMOND T. HOSER

488 Park Road, Park Orchards, Victoria, 3134, Australia.
***Phone*: +61 3 9812 3322 *Fax*: 9812 3355 *E-mail*: snakeman (at) snakeman.com.au**
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ABSTRACT

The divergent genus *Platyplectrum* Günther, 1863 as currently understood consists of two morphologically similar species according to Cogger (2014), this representing the consensus view in Australian herpetology.

These are *Platyplectrum ornatum* (Gray, 1842) and *P. spenceri* (Parker, 1940).

Notwithstanding this, a dissenting view as put by Wells and Wellington (1985) regards the species *P. ornatum* as consisting at least four species, and resurrected three available names for each of the other alleged variants, scattered across east and northern Australia, although they provided no evidence to support their contention. Hence their view has been effectively ignored by others since.

My own inspections of the regional forms of *P. ornatum* including many thousands of individual specimens, spanning more than four decades of intensive fieldwork across Australia, does suggest more than one species is currently lumped within this group, with a proper diagnosis for three clearly different species provided herein.

These are the nominate form from the Northern Territory, found throughout the dry tropics, *P. marmoratum* Günther, 1863 from the south-east and east of Australia and a third form for which no name is available, that is found in the wet tropics region in a coastal band running north from about Townsville, Queensland.

That species is is formally named *P. shaneblacki sp. nov*. according to the provisions of the *International Code of Zoological Nomenclature* current, in force edition (Ride *et al*. 1999).

Until now, no one has suggested that *P. spenceri* (Parker, 1940) consists of more than a single species. However inspection of many hundreds of specimens in central and western Australia has led me to conclude that there are two very different forms, apparently geographically separated by the Gibson Desert in the east of Western Australia, which should be classed as separate species, as outlined in this paper.

In fact inspection of specimens within each group, makes the conclusion they are separate species based on their morphology, unescapable.

The unnamed form from Western Australia, is formally named according to the provisions of the *International Code of Zoological Nomenclature*.

Furthermore while both the *P. ornatum* and *P. spenceri* species complexes are similar morphologically and clearly have phylogenetic affinities, there are significant morphological differences which imply some distance in this relationship and sufficient to warrant the *P. spenceri* group of species being placed in its own genus.

As no name is available, they are herein placed in the genus *Rotundishius gen. nov.* according to the provisions of the *International Code of Zoological Nomenclature*,

Keywords: Taxonomy; frogs; Anura; genus *Platyplectrum*; species; *ornatum*; *spenceri*; *marmoratum*; *occidentale*; *frauenfeldi*; Northern Territory; Western Australia; Australia; new genus; *Rotundishius*; new species; *shaneblacki*; *hayi*.

INTRODUCTION

The divergent frog genus *Platyplectrum* Günther, 1863 as currently understood consists of two morphologically similar species according to Cogger (2014), this representing the consensus view in Australian herpetology.

These are *Platyplectrum ornatum* (Gray, 1842) and *P. spenceri* (Parker, 1940).

Notwithstanding this, a dissenting view as put by Wells and Wellington (1985) regards the species *P. ornatum* as consisting at least four species, and resurrected three available names for each of the other alleged variants, scattered across east and northern Australia.

Because they provided no evidence to support their contention, their view has been effectively ignored by others since.

My own inspections of the regional forms of *P. ornatum* including many thousands of individual specimens, spanning more than four decades of intensive fieldwork across Australia, does suggest more than one species is currently lumped within this group.

Hence I herein provide a proper diagnosis for three clearly different species as part of the description of the new species *P. shaneblacki sp. nov*..

These are:

1/ The nominate form from the Northern Territory, found throughout the dry tropics:

2/ *P. marmoratum* Günther, 1863 from the south-east and east of Australia, and;

3/ A third form for which no name is available, that is found in the wet tropics region in a coastal band running north from about Townsville, Queensland.

That species is is formally named *P. shaneblacki sp. nov*. according to the provisions of the *International Code of Zoological Nomenclature* current, in force edition (Ride *et al*. 1999).

I had gathered considerable evidence to split the species as currently recognized, using well-defined morphological characteristics, but had the relevant research files illegally stolen in an armed raid on my facility on 17 August 2011 (see Court of Appeal Victoria, 2014 and VCAT 2015 for a summary of the relevant events).

In the absence of this material I delayed splitting the species *P. ornatum* as currently recognized, but note that such a split is inevitable and that as of early 2016, the relevant materials are not likely to ever be returned.

Therefore and with minimal data available, I do herein define three

clearly obvious species within the *P. ornatum* group as a highly conservative first step to properly dealing with the complex.

It should be noted that this appears to be the minimum number of species within the complex and there may well be others.

With the name *P. marmoratum* (Günther, 1863) (type locality "Clarence River, NSW"), originally named as *Discoglossus ornatum* Gray, 1842 available for the south-east and East Australian populations, the name *Opisthodon frauenfeldi* Steindachner, 1867 (type locality Rockhampton,Qld) is herein ignored and treated as a junior synonym of the former.

Inspection of numerous specimens from both type localities, finds them effectively indistinguishable and therefore of the same species.

This conclusion is made in the absence of any evidence to the contrary and in spite of the distance between the locations. I note also that distribution appears to be continuous between both locations and in the absence of any obvious physical barriers to their dispersal.

There are no available types of *P. occidentale* Cope, 1866, and specimens from the Kimberley region do appear to be morphologically distinct from the top end of the NT animals. However the variability of specimens in both areas and overlap of forms, has led me to provisionally treat Kimberley animals as being of the same species as the tropical NT ones.

Specimens from the general area of Magnetic Island (Townsville), Queensland, north and through the coastal wet tropics, at least as far north as Iron Range, in far north Queensland, have significant and consistent morphological differences from those found south and west of this region.

There is no clinal area known between the populations and the differences are such that they warrant them being trated as a separate species. This is particularly as there is little if any significant change in morphology in specimens from the central coast of New South Wales (Sydney) through to the Rockhampton area of Queensland (which is 1406 km by road) and then an apparently sudden change when one reaches the coastal wet zone of far north Queensland (using Townsville as a start point), just 718 km by road apart.

Thus, as already mentioned, these animals are therefore formally named *P. shaneblacki sp. nov.*.

Hence, while this paper adopts the view that *P. ornatum* as currently recognized consists of at least four different species, this division is not along the same lines suggested by Wells and Wellington in 1985.

Until now, no one has suggested that *P. spenceri* (Parker, 1940) consists of more than a single species. However inspection of many hundreds of specimens in central and western Australia over a 25 year period had led me to conclude that there were two very different forms as far back as in 1983.

These are apparently geographically separated by the Gibson Desert and hence should be classed as separate species, as outlined in this paper.

In fact inspection of specimens within each group, makes the conclusion they are separate species unavoidable and this is easily duplicatable by any interested party.

The unnamed form from Western Australia, is formally named according to the provisions of the *International Code of Zoological Nomenclature*, current, in force edition (Ride *et al*. 1999).

Furthermore while both the *P. ornatum* and *P. spenceri* species complexes are similar morphologically and clearly have phylogenetic affinities, there are significant morphological differences, many previously documented the literature, which imply some distance in this relationship and sufficient to warrant the *P. spenceri* group of species being placed in its own genus.

P. ornatum has little if any significant webbing on the hind feet. This contrasts with the *P. spenceri* species complex, which has significant webbing on the hind feet (more than half, versus less than a quarter). Furthermore there is no proximal tubercle on the fourth toe in the *P. spenceri* species complex, whereas one is present in the *P. ornatum* species group.

The *P. spenceri* species complex also has a slightly more pointed snount than seen in *P. ornatum*.

Furthermore Pyron and Weins (2011), in their molecular phylogeny, showed a significant divergence between the species *P. ornatum* and *P. spenceri* and enough to warrant a split of the genus. Their published phylogeny in fact found *P. ornatum* to be more closely related to the very dissimilar (in form and habit) genus *Lechriodus* Boulenger, 1882, than to *P. spenceri*, although based on forms and habits of the relevant taxa, one may infer that something may be amiss with that particular result and that more sampling of relevant species should take place.

As no genus name is available for the *P. spenceri* group of species is available, they are herein placed in the genus *Rotundishius gen. nov.* according to the provisions of the *International Code of Zoological Nomenclature*.

The genus *Rotundishius gen. nov.* is described below, followed by the formal description of the new species *hayi*, which is also placed in this new genus.

The description of *P. shaneblacki sp. nov.* follows these descriptions.

ROTUNDISHIUS GEN. NOV.

Type species: *Rotundishus hayi sp. nov.* (this paper / described below).

Diagnosis: Frogs in the genus *Platyplectrum* Günther, 1863 have little if any significant webbing on the hind feet. This contrasts with the *P. spenceri* species complex, herein placed in the genus *Rotundishus gen. nov.*, which has significant webbing on the hind feet (half or significantly more than half (depending on the species), versus less than a quarter). Furthermore there is no proximal tubercle on the fourth toe in the *P. spenceri* species complex (*Rotundishus gen. nov.*), whereas one is present in the *P. ornatum* species group (*Platyplectrum* Günther, 1863).

Secondary sexual characteristics of myobatrachids include the nuptial excrescences on the first three fingers in the males of some species and flanges on the first and/or second fingers in females associated with the production of foam nests during egg deposition. Both nuptial excrescences and flanges are

subject to seasonal or ontogenetic variation.

Nuptial excrescences are usually glandular and located at the base of the first finger.

Under the Scanning Electron Microscope, the nuptial excrescences appear as radial processes in (*Rotundishus spenceri*) (*sensu lato*) or alary processes in (*Platyplectrum ornatum*) (*sensu lato*). The nuptial excrescences of *P. ornatum* are found on the first three fingers (illustrated by Tyler and Davies 1986) whilst in *R. spenceri* there are several pads on the first two fingers (illustrated by Tyler, Smith and Johnstone 1984).

A diagnosis of *Platyplectrum* Günther, 1863, taken as including *Rotundishus gen. nov.* as defined above is seen in Cogger (2014).

It is effectively paraphrased here as follows:

Both species of *Rotundishius gen. nov.* and *Platyplectrum* are characterised and separated from all other Australian species by the following suite of characters. They are well-built ground-dwelling and frogs of rotund build and of burrowing habits. The limbs are short and powerful and the hindlimbs lack obvious tibial glands. Maxillary teeth are present. There is a frontoparietal foramen in adults.

Vomerine teeth are prominent, behind the choanae and extending laterally beyond their inner borders. The tongue is large and oval-shaped. The pupil is slightly elliptical with a horizontal axis. Tympanum is either indistinct or hidden. Phalanges simple, tips of digits without dilations. Second finger is not much shorter than the first. Breeding females have one or more fingers flanged to be used in "puddling" the egg mass into a floating frothy mass.

Distribution: Arid parts of central and Western Australia, south of the tropics and north of the Lake Eyre region, not including north-west New South Wales.

Etymology: Named in reflection of the shape of the relevant species, noting the name *Rotundishus* is 'made up" and latinized in a form that makes it unique and therefore compliant with the rules of homonymy and priority. The name and spelling are intentional. The name should not be altered unless mandatory according to the rules of the *International Code of Zoological Nomenclature.*

Content: *Rotundishius hayi sp. nov.* (type species); *R. spenceri* (Parker, 1940).

ROTUNDISHIUS HAYI SP. NOV.

Holotype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, specimen number: R97406 from

8 km west of Samphire Flats, Western Australia.
This Museum is a government owned facility that allows public access to its specimens.

Paratype: A preserved specimen at the Western Australian Museum, specimen number: R10359 from Manilya, Western Australia.

Diagnosis: *Rotundishius hayi sp. nov*. is readily separated from *R. spenceri* (Parker, 1940), by its colouration. In *R. spenceri* the dorsal colouration is one of a light beige colouration overwritten with a pattern of irregular dark blotches.

By contrast in *R. hayi sp. nov*. the borders of the dark blotches are not well defined and hence the overall colouration is of a marbled appearance. In *R. hayi sp. nov*. the sides are not marked with dark spots or blotches, in contrast to *R. spenceri*, or if present they are very faded.

In *R. spenceri* the toes of the hind feet are slightly more than half webbed. By contrast, in *R. hayi sp. nov*. are 2/3 to 3/4 webbed.

The forelimbs of *R. spenceri* are either banded or marked with distinctive large dark blotches. By contrast in *R. hayi sp. nov*., the forelimbs have no such markings and are either unmarked, speckled or with small dark blotches on the lower part of the limbs only.

The iris of *R. spenceri* is charcaterised as being beige to orange-brown above and brownish to grey below. By contrast the iris of *R. hayi sp. nov.* is characterised as being red to orange above and whitish pink or salmon below.

Both species of *Rotundishius gen. nov*. and *Platyplectrum* are characterised and separated from all other Australian species by the following suite of characters. They are well-built ground-dwelling and frogs of rotund build and of burrowing habits. The limbs are short and powerful and the hindlimbs lack obvious tibial glands. Maxillary teeth are present. There is a frontoparietal foramen in adults.

Vomerine teeth are prominent, behind the choanae and extending laterally beyond their inner borders. The tongue is large and oval-shaped. The pupil is slightly elliptical with a horizontal axis. Tympanum is either indistinct or hidden. Phalanges simple, tips of digits without dilations. Second finger is not much shorter than the first. Breeding females have one or more fingers flanged to be used in “puddling” the egg mass into a floating frothy mass.

Distribution: Arid parts of Western Australia, west of the Gibson Desert.

Etymology: Named in honour of Chris Hay of Queensland, Australia, currently working as a wildlife demonstrator on the Gold Coast, formerly of Gisborne, Victoria for various services to herpetology over a number of decades.

PLATYPLECTRUM SHANEBLACKI SP. NOV.

Holotype: A preserved specimen, number R.83582, at the Australian Museum in Sydney, NSW, Australia, collected at, 3 miles south of Port Douglas, Queensland, Australia, Latitude -16.516, Longitude 145.450. This Museum is a government owned facility that allows public access to its specimens.

Paratype: Preserved specimens, numbers R.83581, R.83583, R.83584 and R.148981 at the Australian Museum in Sydney, NSW, Australia, collected at, 3 miles south of Port Douglas, Queensland, Australia, Latitude -16.516, Longitude 145.450.

Diagnosis: Many *P. shaneblacki sp. nov.* including all or most males, are readily separated from all other *Platyplectrum* species by a thick (wide) light brown to yellowish white mid dorsal stripe running from the snout to the very rear of the body.

Where such a stripe occurs in other species (usually *P. ornatum sensu stricto*), the stripe is either narrow or broken by dark pigment within the stripe, either as another stripe or patches, and furthermore does not noticeably expand in the region of the eyes as seen in *P. shaneblacki sp. nov.*. In the case of *P. ornatum* from northern Western Australia the stripe also significantly narrows near the snout, whereas in *P. shaneblacki sp. nov.* the stripe either does not narrow anteriorly, or at best, very slightly.

P. shaneblacki sp. nov. and *P. marmoratum* Günther, 1863 are separated from *P. ornatum* by the patterning on the snout. In both these species the darker margins of the broad lighter stripe running from the snout backwards are well defined with a blackish border. In *P. ornatum* the same boundary is ill defined.

P. marmoratum Günther, 1863 is separated from *P. shaneblacki sp. nov.* and *P. ornatum* by dorsal colouration. *P. marmoratum* has well defined smallish to medium dark blackish blotches on the flanks and lower flanks. These are either absent or indistinct in *P. shaneblacki sp. nov.* and *P. ornatum.*

P. ornatum has a small number of small dark blotches on the upper surface. Commonly specimens are almost uniformly red-brown above. In *P. shaneblacki sp. nov.* the limited amount of dorsal dark spotting or blotches tends towards being longitudinal stripes. By contrast the dorsal surface of *P. marmoratum* is characterised with a considerable amount of spotting and non-straight striping and futher distinguished by a significant amount of well-defined darker spots and striping within the lighter stripes and patches, not seen in *P. shaneblacki sp. nov.* and rarely seen in *P. ornatum.*

Distribution: *P. shaneblacki sp. nov.* is known to occur from Magnetic Island in the south, which is immediately near Townsville, Queensland, north along the coast as far as Iron Range on Cape York.

P. ornatum is found in the dry tropics in the NT and WA, with eastern limit of the range unknown.

P. marmoratum is found from the central coast of New South Wales, north past Rockhampton in Queensland, to near Townsville, North Queensland and also in dry country to the west of this, including much of western Queensland and a significant area in north-east New South Wales, believed to include an area generally east and south-east of Mount Isa, Queensland.

Etymology: Named in honour of Shane Black, a herpetologist and snake breeder formerly of New South Wales and now of north Queensland in recognition of his work with numerous reptiles (mainly venomous snakes) and who has also worked with ths particular species of frog.

The name “shaneblacki” was chosen in preference to the word “blacki” in this instance so to identify Shane Black in particular, noting how common the surname “Black” is within Australia.

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CONFLICT OF INTEREST

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New frogs of the genus *Mixophyes* Günther, 1864 from Eastern Queensland, and New South Wales, Australia (Anura:Myobatrachidae).

RAYMOND T. HOSER

488 Park Road, Park Orchards, Victoria, 3134, Australia.
***Phone*: +61 3 9812 3322 *Fax*: 9812 3355 *E-mail*: snakeman (at) snakeman.com.au**
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ABSTRACT

The genus *Mixophyes* Günther, 1864 as currently recognized consists of 7 East Australian and one southern New Guinea species of frog. There are no currently recognized subspecies.

Frogs currently treated as being of the species *M. fasciolatus* have long been known to consist of a number of geographically isolated populations.

Inspections of relevant frogs has shown that there are consistent morpholological differences between adult frogs in each population and due to their obvious reproductive isolation, it makes sense that they should be treated as full species.

This paper herein formally describes two new species within the *M. fasciolatus* species group. These are *M. shireenae sp. nov.* from near Mackay in Queensland and *M. couperi sp. nov*. from Kroombit Tops in Queensland.

The divergent member within the genus as currently recognized, namely *M. iteratus* Straughan, 1968, is herein placed in a new subgenus *Paramixophyes subgen. nov.*.

The species *M. iteratus* appears to be found in three separate zones, each separated by intervening dry areas. Each population is morphologically distinct. Therefore the unnamed (at subspecies level) populations isolated south of the Hunter Valley in New South Wales and that from the Sunshine Coast, Queensland are herein assigned to the subspecies *M. iteratus piersoni subsp. nov*. and *M. iteratus yeomansi subsp. nov*. respectively.

Keywords: Taxonomy; frogs; *Mixophyes*; *fasciolatus*; *iteratus*; Queensland; New South Wales; Australia; new subgenus; *Paramixophyes*; new species; *couperi*; *shireenae*; new subspecies; *piersoni*; *yeomansi*; geographical barrier; Myobatrachidae; morphological differences.

INTRODUCTION

The genus *Mixophyes* Günther, 1864 as currently recognized consists of 7 East Australian and one southern New Guinea species of frog.

These large species have been the subject of renewed taxonomic interest in recent years, with two species described as recently as 2006 (Cogger 2014).

Frogs currently treated as being of the species *M. fasciolatus* have long been known to consist of a number of geographically isolated isolated populations, although Cogger *et al.* (1983) show no available synonyms for these populations, were they to be given taxonomic recognition.

Inspections of relevant frogs has shown that there are consistent morpholological differences between adult frogs in each population and due to their obvious reproductive isolation, it makes sense that they should be treated as full species.

In the absence of available names, two are assigned (one for each species) in accordance with all the rules of the current *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

The geographical barriers that separate the relevant populations are well known and have been defined in the literature many times. In essence they are expansive dry zones that have isolated rainforest remnants, which is where these frogs persist. They tend to be found in wet forest areas in the vicinity of larger permanent creeks and rivers in hilly areas or immediately proximal to them.

This paper herein formally describes two new species within the *M. fasciolatus* species group. These are *M. shireenae sp. nov.* from near Mackay in Queensland and *M. couperi sp. nov.* from Kroombit Tops in Queensland, a series of large forested hills, south-west of the industrial city of Gladstone.

They are formally described below.

The divergent member within the genus *Mixophyes* as currently recognized, namely *M. iteratus* Straughan, 1968, is readily separated from all other species, which form a well-defined clade.

M. iteratus is separated from all other species in the genus by the fact that the length of the inner metatarsal tubercle is only about half the length of the first toe (versus being nearly of equal length), and that only two joints of the fourth toe are free of web (versus three joints of the toe being free of web in the other species).

Physically *M. iteratus* presents as being of different shape to the other species by being more triangular in shape and with proportionately larger hind limbs.

M. iteratus is also of a different size class to the other members of the genus, it attaining up to 115 mm in body length, versus no more than 100 mm (usually 80 mm) in the other species.

As a result of these significant differences and sympatry between *M. iteratus* and the other species complex, *M. iteratus* is herein placed in a new subgenus, namely *Paramixophyes subgen. nov.*.

The species *M. iteratus* appears to be found in three separate zones, each separated by intervening dry zones. Each are morphologically distinct. Therefore the unnamed (at subspecies level) isolated Sunshine Coast, Queensland population and that from south of the Hunter Valley dry zone in New South Wales are herein assigned to the subspecies *M. iteratus yeomansi subsp. nov.* (Qld) and *M. iteratus piersoni subsp. nov.* (NSW).

Publications relevant to the taxonomic decisions within this paper

include Barker *et al.* (1995), Cogger (2004), Cogger *et al.* (1983), Corben and Ingram (1987), Donnellan *et al.* (1990), Gillispe and Hines (1999), Günther (1864), Keogh *et al.* (2003), Mahony *et al.* (2006), McDonald (1992), Strachan (1968), Wells and Wellington (1985), and sources cited therein.

MIXOPHYES SHIREENAE SP. NOV.

Holotype: A preserved specimen in the Queensland Museum, Brisbane, Queensland, specimen number: J53605, collected from Mount Blackwood National Park, near Mackay, Queensland.

The specimen had another catalogue number, namely 1977722.

The Queensland Museum, Brisbane, Queensland is a government-owned facility that allows public access to its specimen holdings.

Diagnosis: Until now this species had been treated as a variant of *M. fasciolatus* Günther, 1864.

Mixophyes shireenae sp. nov. is separated from *M. couperi sp. nov*. and *M. fasciolatus* Günther, 1864 by the presence of thick dark bars circling the dorsal surfaces of the hind limbs, versus narrow dark bands in the other two species, which may or may not fully encircle the dorsal surface of the limb.

Both *Mixophyes shireenae sp. nov*. and *M. fasciolatus* Günther, 1864 have a series of conspicuous black spots or blotches on the sides (listed as diagnostic for *M. fasciolatus* by Cogger 2014). These are absent, inconspicuous or very small in *M. couperi sp. nov*..

In *M. fasciolatus* Günther, 1864 there is a large darker blotch in the middle of the back that extends unbroken across the sides to the flanks. In *M. shireenae sp. nov*. and *M. couperi sp. nov.* the main mid dorsal blotch is narrower, not extending to the flanks and is also irregular in shape.

M. fleayi Corben and Ingram, 1987 is separated from others in the genus by the fact that the upper lip is brownish, when viewed at the level of the nostril, with one or more dark purplish brown blotches (in adults), faded complete bands across the upper surface of the lower hind limbs and a straight edge at the anterior margin of the dark linear dorsal blotch running from the level of the eyes (mid level) to the lower back.

M. coggeri Mahony *et al.* 2006, is readily separated from the other species in the genus by the dorsal patterning which consists of a very distinctive discontinuous series of irregularly shaped, dark vertebral blotches between the eyes and rump.

M. carbinensis Mahony *et al.* 2006 is readily separated form the other species in the genus by the colouration of the hind side of the thighs, which are darkish brown and with numerous scattered small pale whitish spots.

M. schevilli Loveridge, 1933 is separated from the others in the genus by the presence of a continuous or near continuous irregular dark blotch on the dorsal surface, faded bands on the lower hind feet and yellowish underside.

The species *Mixophyes hihihorlo* Donnellan, Mahony and Davies, 1990 from New Guinea, known only from the type locaility Namosado, in Southern Highlands Province, Papua New Guinea, at 930m asl. is separated from all others in the genus by a relatively smaller eye and karyotype differences as outlined in the original description of the taxon.

The divergent member within the genus *Mixophyes* as currently recognized, namely *M. iteratus* Straughan, 1968, is readily separated from all other species, which form a well-defined clade.

M. iteratus is separated from all other species in the genus by the fact that the length of the inner metatarsal tubercle is only about half the length of the first toe (versus being nearly of equal length), and that only two joints of the fourth toe are free of web (versus three joints of the toe being free of web in the other species).

Physically *M. iteratus* presents as being of different shape to the other species by being more triangular in shape and with proportionately larger hind limbs.

M. iteratus is also of a different size class to the other members of the genus, it attaining up to 115 mm in body length, versus no more than 100 mm (usually 80 mm) in the other species.

A key to separate of the seven previously recognized species of *Mixophyes* from Australia is provided by Cogger (2014) and good colour photos of the nominate forms of the relevant species are provided in proximity in that text (pages 94-98), although some of the distribution maps provided are in error and at variance to the text in the book.

In turn Cogger (2014) has a key that separates *Mixophyes* from all other Australian frogs.

Distribution: Known only from wetter ranges and immediately adjacent locations near Mackay, coastal Queensland.

Etymology: Named in honour of my wife, Shireen Hoser, in recognition for her monumental contributions to herpetology spanning some decades.

MIXOPHYES COUPERI SP. NOV.

Holotype: A preserved specimen in the Queensland Museum, Brisbane, Queensland, specimen number: J40112, collected from Kroombit Tops National Park,south-west of Gladstone, Queensland.

The specimen had another catalogue number, namely 1969747.

The Queensland Museum, Brisbane, Queensland is a government-owned facility that allows public access to its specimen holdings.

Diagnosis: Until now this species had been treated as a variant of *M. fasciolatus* Günther, 1864. *Mixophyes shireenae sp. nov*. described above is separated from *M. couperi sp. nov*. and *M. fasciolatus* Günther, 1864 by the presence of thick dark bars circling the dorsal surfaces of the hind limbs, versus narrow dark bands in the other two species, which may or may not fully encircle the dorsal surface of the limb.

Both *Mixophyes shireenae sp. nov*. and *M. fasciolatus* Günther, 1864 have a series of conspicuous black spots or blotches on the sides (listed as diagnostic for *M. fasciolatus* by Cogger 2014). These are absent, inconspicuous or very small in *M. couperi sp. nov*., which readily separates this taxon from the other two.

In *M. fasciolatus* Günther, 1864 there is a large darker blotch in the middle of the back that extends unbroken across the sides to the flanks. In *M. shireenae sp. nov*. and *M. couperi sp. nov.* the main mid dorsal blotch is narrower, and not extending to the flanks and is also irregular in shape.

M. fleayi Corben and Ingram, 1987 is separated from others in the genus by the fact that the upper lip is brownish, when viewed at the level of the nostril, with one or more dark purplish brown blotches (in adults), faded complete bands across the upper surface of the lower hind limbs and a straight edge at the anterior margin of the dark linear dorsal blotch running from the level of the eyes (mid level) to the lower back.

M. coggeri Mahony *et al.* 2006, is readily separated from the other species in the genus by the dorsal patterning which consists of a very distinctive discontinuous series of irregularly shaped, dark vertebral blotches between the eyes and rump.

M. carbinensis Mahony *et al.* 2006 is readily separated form the other species in the genus by the colouration of the hind side of the thighs, which are darkish brown and with numerous scallerted small pale whitish spots.

M. schevilli Loveridge, 1933 is separated from the others in the genus by the presence of a continuous or near continuous irregular dark blotch on the dorsal surface, faded bands on the lower hind feet and yellowish underside.

The species *Mixophyes hihihorlo* Donnellan, Mahony and Davies, 1990 from New Guinea, known only from the type locaility Namosado, in Southern Highlands Province, Papua New Guinea, at 930m asl. is separated from all others in the genus by a relatively smaller eye and karyotype differences as outlined in the original description of the taxon.

The divergent member within the genus *Mixophyes* as currently recognized, namely *M. iteratus* Straughan, 1968, is readily separated from all other species, which form a well-defined clade.

M. iteratus is separated from all other species in the genus by the fact that the length of the inner metatarsal tubercle is only about half the length of the first toe (versus being nearly of equal length), and that only two joints of the fourth toe are free of web (versus three joints of the toe being free of web in the other species).

Physically *M. iteratus* presents as being of different shape to the other species by being more triangular in shape and with proportionately larger hind limbs.

M. iteratus is also of a different size class to the other members of the genus, it attaining up to 115 mm in body length, versus no more than 100 mm (usually 80 mm) in the other species.

A dichotomous key to separate of the seven previously recognized species of *Mixophyes* from Australia is provided by Cogger (2014) and good colour photos of the nominate forms of the relevant species are provided in proximity in that text (pages 94-98), although some of the distribution maps provided are in error and at variance to the text in the book.

In turn Cogger (2014) has a key that separates *Mixophyes* from all other Australian frogs.

Distribution: Known only from wetter ranges and immediately adjacent locations near Kroombit Tops, Queensland.

Etymology: Named in honour of Patrick Couper, long-term curator of reptiles at the Queensland Museum for his many services to herpetology and taxonomy.

PARAMIXOPHYES SUBGEN. NOV..

Type species: *Mixophyes iteratus* Straughan, 1968.

Diagnosis: The divergent member within the genus *Mixophyes* as currently recognized, namely *M. iteratus* Straughan, 1968, is monotypic for this subgenus as recognized herein.

This paper does divide it into three subspecies (the two new ones named below), based on clear morphological and geographical divergences and these may ultimately be elevated to full species status if molecular evidence supports this.

This paper does however provide proper taxonomic recognition to these populations in accordance with the rules of the relevant edition of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

M. iteratus Straughan, 1968 is readily separated from all other species of *Mixophyes* which form a well-defined clade.

M. iteratus is separated from all other species in the genus by the fact that the length of the inner metatarsal tubercle is only about half the length of the first toe (versus being nearly of equal length in the other species), and that only two joints of the fourth toe are free of web (versus three joints of the toe being free of web in the other species).

Physically *M. iteratus* presents as being of different shape to the other species by being more triangular in overall shape and with proportionately larger hind limbs.

M. iteratus is also of a different size class to the other members of the genus, it attaining up to 115 mm in body length, versus no more than 100 mm (usually 80 mm) in the other species.

Straughan (1968) provides detail of other differences between *M. iteratus* and others in the genus.

Distribution: Blue Mountains west of Sydney, NSW, north of the Great Western Highway in the Grose River Valley and nearby large streams and environs, as wll as the coastal ranges and nearby wet forests north of the Hawkesbury River System, to the Hunter Valley in NSW (*M. iteratus piersoni subsp. nov.*), the ranges north-west of Newcastle, NSW and various coastal and near coastal locations to the wetter areas west and south-west of the Gold Coast Queensland (nominate *M. iteratus iteratus*) and ranges and nearby areas, north and west of Brisbane, including the Sunshine Coast hinterland (*M. iteratus yeomansi subsp. nov.*).

Etymology: *Para*, meaning as in "not quite" is linked with the nominate genus name *Mixophyes* Günther, 1864.

Content: *Mixophyes iteratus* Straughan, 1968 (including a total of three subspecies).

MIXOPHYES* (*PARAMIXOPHYES*) *ITERATUS PIERSONI SUBSP. NOV.

Holotype: A specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R70147 collected at near Wyong, NSW, by Cliff Ross Wellington.

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

Paratype: A specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R78774 collected at near Wyong, NSW.

Diagnosis: *M. iteratus piersoni subsp. nov.* is readily separated from the other two species by the presence of small dark spots on the dorsal surface, versus a smaller number of larger (medium sized) spots on the dorsal surface in the other two subspecies. These spots as described are in addition to the singe large mid dorsal stripe or blotch which may or not be absent in all three subspecies.

M. iteratus piersoni subsp. nov. is characterised by 9-10 crossbands on the upper thigh, versus 7-8 in the other two subspecies.

M. iteratus piersoni subsp. nov. is further separated from the other two subspecies by the presence of a distinct dark line running from the lower front of the eye to the upper lip. In other other subspecies this marking forms an ill defined blotch or blob (as opposed to a line) which may or may not merge with lighter posterior pigment.

M. iteratus piersoni subsp. nov. and *M. iteratus iteratus* are separated from *M. iteratus yeomansi subsp. nov.* by the presence of a thin black line bordering the upper tympanum, versus a moderately thick line in *M. iteratus yeomansi subsp. nov.*.

M. iteratus yeomansi subsp. nov. is readily separated from the other two subspecies by a distinctive salmon coloured sheen across the extremities of the limbs and the upper lips and snout.

Straughan (1968) and Cogger (2014), provide a key to separate *M. iteratus* from all other s in the genus.

Distribution: Blue Mountains west of Sydney, NSW, north of the Great Western Highway in the Grose River Valley and nearby large streams and environs, as wll as the coastal ranges and nearby wet forests north of the Hawkesbury River System, to the soputh side of the Hunter Valley in NSW

Etymology: Named in honour of Charles Pierson of Bowral, NSW, for his monumental contributions to wildlife conservation in Australia, including as publisher of Hoser (1989, 1991 and 1993). Australians, Americans and others allege to claim to cherish the freedom of the individual. Included here is the freedom of individuals to keep and study snakes and other wildlife. In years postdating the late 1960's 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 *Smuggled: The Underground Trade in Australia's Wildlife* in 1993, took an incredibly courageous step in publishing it.

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, including control of media and information flow to the public. Persons publishing material critical of government, even when totally

true and correct, 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. Only as a result of a supreme effort by Pierson and an extremely brave and courageous journalist named 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 government wildlife control bureaucracy should be permanently recognized. 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", including Bruce George, Mark O'Shea, Chris Humfrey and others as a reference source to bring Australian animals to TV viewers globally.

Unfortunately as this paper goes to press in 2016 there are new assaults on the rights of reptile keepers and herpetologists both in the USA, Australia and elsewhere with new restrictions either passed or about to be passed in these jurisdictions.

It is significant that the NSW Government has done a fantastic job of "managing" this subspecies of frog *M. iteratus piersoni subsp. nov*. (and many others) towards extinction in the period 1970 to present (2016) and wasting many hundreds of millions of dollars in the process, paying bureaucrats on the money gravytrain while simultaneously destroying the lives of the very people who could potentially help save the subspecies.

The government pursuit of a "big Australia policy" which involves long-term crowding of another 200 million people into Australia within the next 200 years (current population under 25 million people), will without doubt cause a mass of wildlife extinctions including quite possibly the subspecies *M. iteratus piersoni subsp. nov*.!

MIXOPHYES* (*PARAMIXOPHYES*) *ITERATUS YEOMANSI SUBSP. NOV.

Holotype: A specimen at the Queensland Museum, Brisbane, Queensland, Australia, specimen number: J64087 collected at Belli Creek Crossing number 3, at the Sunshine Coast, Queensland.

The Queensland Museum, Brisbane, Queensland is a government-owned facility that allows public access to its specimen holdings.

Paratype: A specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R27629 collected at Rainforest National Park, near Nambour, Queensland.

Diagnosis: *M. iteratus yeomansi subsp. nov.* is readily separated from the other two subspecies by a distinctive salmon coloured sheen across the extremities of the limbs and the upper lips and snout.

M. iteratus piersoni subsp. nov. is readily separated from the other two species by the presence of small dark spots on the dorsal surface, versus a smaller number of larger (medium sized) spots on the dorsal surface in the other two subspecies. These spots as described are in addition to the singe large mid dorsal stripe or blotch which may or not be absent in all three subspecies.

M. iteratus piersoni subsp. nov. is characterised by 9-10 crossbands on the upper thigh, versus 7-8 in the other two subspecies.

M. iteratus piersoni subsp. nov. is further separated from the other two subspecies by the presence of a distinct dark line running from the lower front of the eye to the upper lip. In other other subspecies this marking forms an ill defined blotch or blob (as opposed to a line) which may or may not merge with lighter posterior pigment.

M. iteratus piersoni subsp. nov. and *M. iteratus iteratus* are separated from *M. iteratus yeomansi subsp. nov.* by the presence of a thin black line bordering the upper tympanum, versus a moderately thick line in *M. iteratus yeomansi subsp. nov.*.

Straughan (1968) and Cogger (2014), provide a key to separate *M. iteratus* from all other s in the genus.

Distribution: The region north and north-west of Brisbane, Queensland, including the Sunshine Coast and nearby hills forming the eastern rim of the Great Dividing Range.

Etymology: Named in honour of Luke Yeomans, a well-known British Herpetologist, who died prematurely from a King Cobra bite at his UK facility on 29 June 2011.

His contributions to herpetology are numerous and include his pioneering work in breeding the Irian Jaya Dwarf Mulga Snake (*Pseudechis* (*Pailsus*) *rossignollii*) in the decade following my formal description of the taxa in 2000 (Hoser 2000). The results of his breedings are expected to appear in a book about keeping and breeding Australasian elapid snakes by Scott Eipper later in 2012 (Eipper 2012).

Besides being an extremely passionate and skilled herpetologist, Yeomans was also a wonderful human being who never lost sight of the beauty of the reptiles he loved so dearly. However it is the things that went wrong during his life that should be highlighted as a warning to other potential herpetologists in future generations.

Yeomans first came to my attention in the early 1990's after he was prosecuted for the heinous crime of feeding live food to a reptile. For this mortal sin, he was dragged through Britain's criminal courts, prosecuted, convicted and fined. Then he was held up for public hatred in Britain's notorious tabloid media. The legal precedent now sits as a threat and if need be, a means to criminally charge any other reptile keeper who dares use live food for any reptiles, including such humble items as mealworms or crickets and then upsets anyone in a government authority.

Yeomans said he was originally "dobbed in" by another reptile person, Mark O'Shea, whom he said had an axe to grind against him. The relevant authority in this case, the RSPCA in the UK, ran the prosecution. I wrote about the case in the book "*Smuggled: The Underground Trade In Australia's Wildlife*", (Hoser, 1993), and unexpectedly met Yeomans in person at the Orlando Reptile Expo in the United States.

That was in 1993, when the League of Florida Herpetological Societies invited me there to give a talk about Australia's own draconian wildlife law enforcement. As inferred already, it was the personality of Yeomans that impressed me rather than his herpetological skills, noting that in Orlando, I didn't get to see Yeomans working with reptiles!

My next contact with Yeomans was in the period postdating my description of the Irian Jaya Dwarf Mulga Snake in 2000 and him wanting to breed them in captivity. Ultimately he did this. Beyond that, the next conversations related to the issue of safety for himself in his own reptile shows that he intended doing at a "King Cobra Sanctuary" he was planning to open in the UK in mid 2011.

In this, I specifically mean the use of venomoid snakes as described by Hoser (2004). These are snakes that have had their venom glands surgically removed in a virtually painless operation and where the snakes get to keep their fangs and are as far as they are concerned "normal".

By 2010, Yeomans had seen how in the previous 6 years myself and ten staff had done over 10,000 venomous snake shows with the world's five deadliest snakes and without any fatal or near fatal snakebites.

He had seen videos of myself taking bites from the snakes to prove they were safe and was aware of the benefits of the venomoid snakes, not just for the safety aspect, but also the snake's welfare.

In fact Yeomans himself had previously owned a venomoid cobra!

Yeomans toyed with the idea of making all his large King Cobras venomoid because he feared that sooner or later he'd make a handling error and get bitten. However he decided against doing so and the reason for this is important.

He had no issues with the surgery and the false claims of cruelty to the snakesmade by his nemesis Mark O'Shea. In fact in terms of the venomoid snakes, there was no sensible reason for him not to get them except for one. That reason was the expected attacks he would get from Mark O'Shea, a man he described as his sworn enemy and Wolfgang Wüster.

Both were clkose mates in the UK reptile fraternity and both of whom had been key sponsors of an anti-Hoser and antivenomoid petition website. That was created by a convicted wildlife smuggler, David John Williams (who now as of 2016 scams money out of well-meaning people ostensibly to treat snakebite victims in third world countries) and his close friend Shane Hunter in Australia.

Yeomans was in extreme fear that should O'Shea or Wüster become aware of him having venomoid snakes, that they would attack and undermine his reptile display business and worse still have him targeted by the RSPCA again.

With one "animal cruelty" conviction already, Yeomans decided the likelihood of attacks and another more serious conviction would terminally disable his business and so he decided instead to take the risk of keeping his snakes that he handled for shows "hot".

Besides the phone calls we had, Yeomans also sent numerous e-mails complaining about the reckless conduct of Mark O'Shea and his friend Wolfgang Wüster in terms of himself, even detailing how O'Shea had improperly had him expelled from the International

Herpetological Society. Yeomans made countless comments about O'Shea in particular, whom he described as being a cross between a rat and a dog.

He said O'Shea was physically like a rat, as in small, bony and hairy and like a Shitzu dog in that he constantly "yapped", "shits you" and never shuts up. I could devote several pages to the adverse comments made by Yeomans about O'Shea, Wüster and their unethical and criminal behaviour, but these are not particularly relevant beyond what has already been told in terms of how they made Yeomans choose not to protect himself with venomoid Cobras.

On 29 June 2011, Yeomans made the snake handling error that cost him his life. Just days before his "King Cobra Sanctuary" was due to open, one of his "hot" snakes bit him and he died.

At just 47 years of age he was dead!

If Luke Yeomans had not been forced by these other self appointed so-called "herpetologists" to put his life at unnecessary risk with snakes that could easily have been devenomized, he would still be breeding rare and endangered reptiles and educating people at his new "King Cobra Sanctuary".

Much has been made in recent years of the threats to private individuals and their rights to be allowed to keep and study reptiles. The alleged threat is often identified as coming from outside the herpetological community. The usual bogeyman identified are militant animal rights groups and the like.

They are not the real enemy. These people lack expertise in reptiles and do not carry any political or legal power in terms of reptiles and the law. Put simply, no one takes them seriously.

In any event, these animal rights groups concentrate their activities on "nice" "fluffy" animals and not col-blooded reptiles.

By contrast the real enemy is within the reptile community. The reckless conduct of O'Shea and Wüster were in effect directly responsible for the premature death of Yeomans. Here in Australia, in the period from 2006 to 2016, my family, my business, my friends and staff have been subjected to numerous illegal armed raids, fabricated criminal charges and the like designed to destroy the Snakebusters business and put innocent people's lives at risk.

While the raids, criminal charges and the like have been conducted by (in this case) very corrupt government wildlife officers under the control of the corrupt and hateful Glenn Sharp of the Victorian Government Wildlife Department (DSE), the whole series of actions were in fact initiated by people within the reptile fraternity. In our case the enemy was a group of newly established "reptile businesses", which included former employees of the government run zoo, part of the same department that regulates us.

Because they couldn't match the standards of Snakebusters, they simply used their powers to unlawfully close us down!

This was confirmed in a Court of Appeal Judgement in Victoria on 5 September 2014 (Court of Appeal 2014) and again by VCAT (another court) (VCAT 2015) in a ruling dated 30 July 2015.

Because we won in court, this being a miracle of biblical proportions, the government now must pay us millions of dollars in damages. However other victims of the likes of those who brought about the demise of Yeomans are rarely as fortunate.

By naming a frog subspecies after Luke Yeomans, it is hoped that people who look into the etymology of the name, familiarize themselves with the story of his totally avoidable and premature death and see who are the culpable people who not only made his life at times unbearable in life, but also effectively brought it to a premature abrupt end. It's hoped that people realise that the enemies of herpetology are more likely to be ostensibly within the reptile community and a part of it, rather than outside.

CONSERVATION

Notwithstanding myriad potential threats to frogs, including the advance of Chytrid fungus within the range of these species, numbers of the two newly described species from Queensland do not appear to have severely declined in recent years.

This is in contrast with that of other *Mixophyes* species and subspecies from more southern areas of New South Wales and north-east Victoria, which appear to have declined sharply since the 1970's, including *M. iteratus*, which has declined in numbers significantly since the 1970's. By way of example, *M. iteratus piersoni subsp. nov*. was seen by myself in large numbers in the Grose River Valley, north of Blackheath in the 1970's, but has rarely if ever, been seen there since year 2000.

Wildlife laws as administered by State Governments in Australia have done nothing whatsoever to protect native frogs and have in fact impeded research into the frogs and any conservation outcomes that may have arisen. This is well documented by Hoser (1989, 1991, 1993 and 1996) and not only has little changed since these books were written and published, but the significant gains made at the time the books were published to improve wildlife laws, have since 2006 been largely eroded away in most Australian states. This leaves a bleak long-term prognosis for wildlife laws and protection of vulnerable species, if and when they need it.

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CONFLICT OF INTEREST

The author has no known relevant conflicts of interest.