Australasian Journal of Herpetology 21:41-58.
Published 20 October 2013.

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

Monitor Lizards reclassified with some common sense (Squamata: Sauria: Varanidae).

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Received 22 July 2013, Accepted 22 August 2013, Published 20 October 2013.

ABSTRACT

Until now, most species of "Monitor Lizards" all grouped within the family Varanidae have been treated by taxonomists as being within a single genus, namely *Varanus* Merrem, 1820. This is in effect a rehash of the family name that also accommodates all the same diverse group of species.

In the face of this anomaly and the fact that this relatively ancient group of lizards distributed across a number of continental plates is clearly paraphyletic at the genus level, this paper for the first time ever presents a sensible family-wide classification for the living Varanidae.

Resurrecting named genera and/or elevating relevant named subgenera to genus level where appropiate, this paper draws on a combination of inspection of thousands of live and dead varanid specimens from all relevant parts of the world over more than 4 decades and the relevant literature to date, including photos of all described taxa and others yet undescribed to produce a current listing of the living (formally described) Varanidae, described to 2013, based on both morphological and molecular evidence.

Presented is a synopsis, except where it is necessary to define newly named groupings, species or subspecies according to the Zoological Code, for which there is an appropriately expanded coverage.

In summary, the list consists of a number of genera for which there are available names and two more named and defined herein for the first time, long recognized in the literature as highly distinct species groups. Also included are six newly named and defined subgenera for divergent Australian taxa, bringing the taxonomy and nomenclature closer to alignment with that of other reptile groups.

Two species and six subspecies from northern Australia and nearby are also formally described and named for the first time.

The living Varanidae are in turn divided into four tribes, all defined according to the Zoological Code.

The wide dissemination of this publication will no doubt eventually ensure a more realistic taxonomy and nomenclature adopted by others for the living varanids and end the lazy and inappropriate "lumping" of all species within the catch all genus *Varanus*.

Keywords: Taxonomy; nomenclature; Monitors; Varanidae; Wells; Wellington; *Odatria*; *Polydaedalus;* *Pantherosaurus*; *pulcher*; *rosenbergi*; *kuringai*; New tribes; Varaniini; Empugusiini; Shireenhosersauriini; Polydaedaliini; New genera; *Oxysaurus*; *Shireenhosersaurea*; New subgenera; *Aquativaranus*; *Kimberleyvaranus*; *Pilbaravaranus*; *Parvavaranus*; *Arborhabitatiosaurus*; *Honlamus*; new species; *honlami*; *hoserae*; new subspecies; *wellsi*; *wellingtoni*; *nini*; *makhani*; *woolfi*; *hawkeswoodi.*

INTRODUCTION

Until now, most species within the family Varanidae have been treated by taxonomists as being within a single genus, namely *Varanus* Merrem, 1820. This is in effect a rehash of the family name that also accommodates all the same quite divergent species.

For many years, this was not particularly problematic, as the number of described species was relatively few.

However in the past 3 decades the number of recognized species has doubled to include well over 80 named and widely recognized species and further unnamed species awaiting scientific description.

In the face of this anomaly of all being wrongly placed in a single genus and the fact that this relatively ancient group of lizards distributed across a number of continents is clearly paraphyletic at the genus level, some authors have attempted to correct the situation.

Most have been somewhat timid and created subgenera, with the clear intent of allowing other later authors to make the bold step of elevating these to genus rank, but at the same time

securing naming rights to the relevant species groups.

Ignoring the better-known herpetologists from the 1800's such as Gray, Wagler and Fitzinger who virtually randomly assigned species to newly named genera in a colonial-style flag planting exercise, it makes most sense to consider those herpetologists from the last hundred years who have taken to naming the varanid genera with a more scientific approach and within the bounds of the rules of Zoological Nomenclature.

Of the more recent (last hundred years) authors, I should make mention of two authors, Wells and Wellington, who in 1985, co-published two seminal papers (Wells and Wellington, 1983, 1985), which took a rational look at the ridiculous situation of divergent species being placed in a single genus and in response erected several genera to remedy the situation as they saw it and on the basis of the evidence before them at the time.

In terms of the long-term dismemberment of the genus *Varanus*, notable recent authors have included Böhme (2003), Mertens (1942, 1963), Wells and Wellington (1985) and authors who have in turn relied on these works.

Without doubt the most comprehensive efforts to date have been those of Böhme (2003) (updated several times in several forms since, including as Koch *et al.* 2010) and Wells and Wellington (1985). However Böhme's (2003) coverage was disabled and incomplete by his overlooking of the important Wells and Wellington papers of 1983 and 1985, which named relevant Australian species and genera. Wells and Wellington (1985), while a valiant attempt to resolve the taxonomy and nomenclature of the monitors, only looked at Australian members of the Varanidae in the context of a revision of the taxonomy of all Australia's reptiles and frogs.

However as of 2013, the unfortunate reality is that herpetological taxonomy and nomenclature has been hampered by a long-term destabilization campaign by a small group known as the Wüster gang or "truth haters", as Wüster calls his group. See Hoser (2012a, 2012b and 2013) for details, or alternatively the documents cited herein as Kaiser (2012a, 2012b), the latter actually written by Wüster based on what is written by Kaiser himself in Kaiser (2012a) and a similar version of the Wüster document cited herein as Kaiser *et al.* (2013) for the details of their activities in their own words.

As a result of the actions of the Wüster gang, including harassing authors, journal editors and the like, backed up with false claims that they represent a majority of herpetologists, which they do not, the Wells and Wellington publication of 1985 and others by these authors since, have been largely ignored by many other publishing herpetologists in effect setting back Varanid taxonomy by decades (Hoser 2007).

With the influential Wolfgang Böhme and virtually all other publishing varanid specialists continuing to place all species within the genus *Varanus*, and at best making known the existence of previously named subgenera, common usage of *Varanus* for placement purposes of all species has continued.

While such a position may be convenient for some, the stupidity of the situation of non-recognition of relevant genera is seen by the repeated need to identify given species as being within a given "species group" (e.g. Koch *et al.* 2010, 2013), noting that these groups clearly correspond to genus level units.

That the "species groups" correspond to genera is easily seen when they are plotted on molecular phylogenies produced using the relevant species as seen for example in that produced in Figure 14 of Pyron *et. al.* (2013).

While it may cause pain to some to dispense with the cherished name "*Varanus*" for species of monitor lizard they have grown to love and cherish, it does unfortunately make good sense to produce a taxonomy and nomenclature that reflects the phylogeny of the Varanidae. This does of course restrict the genus *Varanus* to the relevant species, being those of the type and others closely allied to it.

Hence for the first time ever, I produce a check-list of the world's described varanids, placing all species within appropriate genera.

Resurecting genera or alternatively elevating the relevant named subgenera to genus level where appropiate, this paper draws on the relevant literature to produce a current listing of the living Varanidae, including over 80 species described to 2013, based on both morphological and molecular evidence, all assigned for the first time, to their correct genus level and subgenus level placements.

Presented herein the material is in the form of a synopsis or list, followed by descriptions of new genera or subgenera as necessary to define newly named groupings according to the Zoological Code (Ride *et al.* 1999) as well as two new species and six new subspecies.

In summary, the list consists of a number of genera and subgenera for which there are available names, and assigned if needed on the basis of nomenclatural priority, if and when more than one name is available.

For unnamed groupings, genera or subgenera are defined below the list in accordance with the Zoological Code (Ride *et al.* 1999). Likewise for two newly named species from Australia and six subspecies from the same general region.

The living Varanidae are also divided into four tribes, all defined according to the Zoological Code.

The wide dissemination of this publication will no doubt ensure a more realistic taxonomy and nomenclature adopted by others for the living varanids and end the lazy lumping of all species groups within the "catch all" genus *Varanus*.

Detailed summaries of the earlier taxonomy and nomenclature of the relevant species are given in some of the publications cited herein, including Böhme (2003) and Koch *et al.* (2010, 2013) and this information is not repeated here.

I do however briefly mention here that *Polydaedalus pulcher* (Leach, 1819) is recognized as a species closely related to *Polydaedalus ornatus* (Daudin, 1803), being the specimens until now referred to the latter species from west of the Dahomey Gap in Africa, readily distinguishable by their larger average size and different labial markings. Most authors, including Böhme (2003) have treated "*pulcher*" as a junior synonym of "*niloticus*".

Because the volume of material published on the living varanids is vast, it is pointless for me to cite all herein. However key publications relied upon in terms of the taxonomy and nomenclature used herein include the following: Ahl (1932), Allison (2006), Aplin *et al.* (2006), Ast (2001), Auffenberg (1981, 1988, 1994), Auffenberg *et al.* (1989), Auliya (2006), Baverstock *et al.* (1993), Bayless (2002), Bayless and Adragna (1999), Becker (1991), Becker *et al.* (1991), Bennett (1998), Bennett and Lim (1995), Bennett and Sweet (2010), Böhme (1988, 1988b, 1991a, 1991b, 1997, 2003, 2010), Böhme and Jacobs (2001), Böhme and Koch (2010), Böhme and Ziegler (1997a, 1997b, 2005, 2007), Böhme *et al.* (1994, 2002), Boulenger (1885), Brandenburg (1983), Branch (1982), Brygoo (1987), Card and Kluge (1995), Ciofi and de Boer (2004), Cogger (1975) *et seq*., Cogger *et al.* (1983), Cota *et al.* (2008), Covacevich and Couper (1994), Daudin (1802), De Lisle (2009), Deeks (2006), Deraniyagala (1944), Doody *et al.* (2009), Doria (1874), Duméril and Bibron (1836), Dunn (1927), Dwyer (2008), Eidenmüller and Philippen (2008), Eidenmüller and Wicker (2005), Erdelen (1991), Ferner *et al.* (2000), Fitch *et al.* (2006), Foufopoulos and Richards (2007), Fuller *et al.* (1998), Gaulke (1998, 2010), Gaulke and Curio (2001), Gaulke *et al.* (2007), Good *et al.* (1993), Gray (1827, 1831, 1831-1835, 1838, 1845), Guibé (1954), Hallowell (1856), Hardwicke and Gray (1827), Harvey and Barker (1998), Heaney and Regalado (1998), Hedges and Vidal (2009), Holmes *et al.* (2010), Horn (1977, 1995), Hoser (1989, 1998, 2003), ICZN (1959, 2000), Iskandar and Mumpuni (2003), Jacobs (2002, 2003), Karunarathna *et al.* (2008), Khatiwada and Ghimire (2009), Keogh *et al.* (2001), Koch (2010), Koch and Böhme (2010), Koch *et al.* (2007, 2009,

2010a, 2010b, 2013), Lauprasert Thirakhupt (2001), Leary (1991), Leviton *et al.* (1985), Linné (Linnaeus) (1758, 1766), McCoy (2006), Merrem (1820), Mertens (1941, 1942, 1946, 1950, 1951, 1956, 1958, 1959, 1962, 1963), Meyer (1874), Müller and Schlegel (1845), Murphy *et al.* (2002), Obst (1977), Ouwens (1912), Pattiselanno *et al.* (2007), Pernetta (2009), Peters (1872), Peters and Doria (1878), Philipp and Philipp (2007), Philipp *et al.* (1999), Pianka *et al.* (2004), Pyron *et al.* (2013), Riquier (1998), Rooij (1915), Schlegel (1837-1844), Schmicking and Horn (1997), Seba (1735), Setiadi and Hamidy (2006), Setiadi *et al.* (2009), Shea and Cogger (1998), Shine *et al.* (1996, 1998), Smith (1935), Smith *et al.* (2007), Somma and Koch (2012), Sprackland (1991, 1993a, 1993b, 1994, 1999, 2009), Stanner (2011), Stejneger (1907), Storr (1980), Suzuki (2006), Sweet and Pianka (2007), Tiedemann *et al.* (1994), Traeholt (1998), Vidal and Blair Hedges (2009), Vidal *et al.* (2012), Vincent and Wilson (1999), Weijola (2010), Weijola and Sweet (2010), Wells and Wellington (1983, 1985), Welton *et al.* (2010), Weerd and Brown (2010), Wesiak (1993), Wesiak and Koch (2009), Wheeler (1998), Wiegmann (1834), Wilson and Knowles (1988), Wilson and Swan (2013), Yuwono (1998), Ziegler and Böhme (1997), Ziegler *et al.* (1998, 1999a, 1999b, 2001, 2007a, 2007b), and sources cited therein.

WELLS AND WELLINGTON'S VARANID SPECIES AND FRAUDULENT ATTEMPTS TO SUPPRESS RECOGNITION OF THEM IN BREACH OF THE ZOOLOGICAL CODE

While I do not seek to give detailed explanations herein as to which species I accept as valid in terms of the list given below, due to the fact that there is generally little dispute in such matters, I will make passing mention of my recognition of species described by Wells and Wellington (1983 and 1985) herein.

This is simply on the basis of a plea for some sense and logic (Hoser, 2007), that has been absent from sections of the taxonomic community for decades and especially so under the guidance of the truth haters in the Wüster gang.

I single out the taxa named by these authors in particular, due to a general non-use by others of the names for taxa they have properly described and named according to the Zoological Code of the time.

Wells and Wellington (1985) did in fact describe and name five well known unnamed forms within Australia, known generally to local herpetologists and in spite of this obvious fact, the use of their species names has in effect been ignored since 1985.

With myself having direct field and laboratory experience with the relevant taxa, there is no question that Wells and Wellington have correctly described unnamed forms.

That this is not an isolated opinion of myself, often incorrectly targeted by the Wüster gang as an agent for the two men. The fact is, I am not in any way an agent for Wells and Wellington as seen by my regular disagreements with sections of their Australian taxonomy.

However the non-use of the appropriate and valid Wells and Wellington names for Australian varanids is seen in the non-stop publications by others on the same taxa since 1985.

Most authors have (often under pressure from others) deliberately refused to cite the important Wells and Wellington publication of 1985, or even use the correct taxon names, thereby misleading other herpetologists and acting in breach of the Zoological Code (Ride *et al.* 1999), by deliberately creating nomenclatural instability in terms of well-known species level-taxa.

While I could mention and detail the totally reckless, and dishonest attempt to Robert Sprackland to rename the Wells and Wellington taxon, "Odatria keithhornei" Wells and Wellington, 1985, after his own wife of the time (as in "Varanus teriae" Sprackland, 1991) and then after deliberately creating nomenclatural and taxonomic instability, seeking to get the ICZN to break their own rules and reverse the fundamental priority rule (he failed) (see Hoser 2013b for details, including ICZN references), I think it is better to refer instead to another of the lesser known Wells and Wellington taxa, the name of which has also been improperly forcibly suppressed by the Wüster gang and others in direct breach of the Zoological Code (Ride *et al.* 1999).

The species "*Pantherosaurus kuringai*" Wells and Wellington 1985, from NSW, was in fact known to be different from the nominate form of "*Varanus rosenbergi*" from Western Australia for decades and the only surprising thing about the Wells and Wellington description of 1985, was that no one else had bothered naming the taxon sooner. Put another way, the surprise was that they had to in fact describe the taxon as new, as opposed to resurrecting an earlier description.

That the taxon is valid, was confirmed by the molecular data of Smith *et al.* (2007), who even published a phylogeny to confirm the fact. Their later claim that they had found the Wells taxon (not named as such by them) was not a distinct species was not supported by the material that they themselves presented.

That these authors had engaged in a case of printed mental gymnastics and use of lies, damned lies and dodgy statistics to get their dubious claims believed by others was confirmed by Bennett and Sweet (2010), who confirmed this. In fact on the basis of the same evidence (directly citing Smith *et al.* 2007), they said of "*Varanus rosenbergi*" that "this species is in fact a complex of two or more species". They also reported that Eric Pianka another varanid expert had told them the same thing!

However if one wants to get a true idea of the dishonest and hypocritical practices used against the herpetologists Wells and Wellington by other so-called herpetologists, Smith *et al.* is a perfect place to start.

Their paper dated 20 November 2007, published by the prestigious Natural History Museum of the UK, and therefore supposedly subject to rigorous peer review, was authored by none other than Warwick Smith, Ian A. W. Scott and J. Scott Keogh from Australia.

Their crude results were a mitochondrial divergence of 8.2 per cent between the West Australian population (type for "*rosenbergi*") and the geographically isolated east Australian population, described by Wells and Wellington in 1985 as "*kuringa*i").

This significant divergence, in conjunction with a known wide geographical barrier, where the species group do not occur, and known consistent morphological differences between populations would as a matter of course in herpetology, automatically qualify as two different species level taxa. However these authors had the audacity to claim it wasn't good enough and told readers to continue to refer to the east Australian specimens as "*rosenbergi*".

That these authors were engaging in gross hypocicy and double standards is easily seen when comparing this result with those in another paper published by Keogh *et al.* in 2001, (yes the same J. Scott Keogh was the lead author). In that paper, Keogh found that a mere 3.2 per cent divergence between the python "species" recognized as *breitensteini* and that recognized as *curtus* was good enough to continue to assert that they were definitely well-defined and different species-level taxa.

Of course the only real reason that Keogh has come up with such a ridiculous result in the 2007 paper he co-authored is because he had an obsessive hatred of Richard Wells and Ross Wellington, and so chose to engage in unscientific and unethical behaviour to refuse to recognize the obvious facts that his own experimental data had shown as correctly based.

Even more disturbing is the fact that the paper of Smith *et al.* was published by university based academics in a prestigious "peer reviewed" publication. How such outrageous conclusions based on data within the same paper could have been allowed to be published shows obvious defects in any peer review or quality control at that journal. Perhaps the journal that published

Smith *et al.* could be best described as PRINO, or "Peer Reviewed In Name Only". Unfortunately PRINO journals are particularly common in terms of herpetology. See Hoser (2013) for several prominent examples.

While talking molecular divergence and species limits for monitor species taxa, see for example Ziegler *et al.* (2007a) who recognize species within the "*indicus*" group of monitors with mitochondrial DNA divergences averaging just 1 per cent!

So if one strips out personal hatreds of authors, it would be obvious to anyone, even of pre-teen school student age, that isolated populations with a separation divergence in the order of 8.2 per cent (or at worst about 4 per cent if one engages in various kinds of "massaging" of numbers as Smith *et al,* attempted) is better qualified than 1 or 3.2 per cent divergences to be split into different species.

As there is no sensible reason to pretend that the Wells and Wellington (1985) paper was never published, the Smith *et al.* results of 8.2 per cent sequence divergence between the NSW and West Australian "*rosenbergi*" consists of incorrect data or results or that as the Wüster gang allege, their names shouldn't be used because they are "unscientific", being code by them, for not written by their own gang, I freely accept the validly named taxa by Wells and Wellington from 1985 and include all five of them in the list herein. This is because all are properly named well known species-level taxa on the basis of the evidence before me! All were published according to the Zoological Code of the time and the ICZN has itself ruled against the unlawful attempts to suppress the Wells and Wellington publications (see Hoser 2013b for details).

Perhaps I should also mention that the Wüster gang have successfully removed numerous Wells and Wellington taxa (even as listed synonyms) from online databases, such as the Peter Uetz managed "The reptile database" (Uetz, 2013).

At "The reptile database", on the advice of Wolfgang Wüster, himself a man with absolutely no meaningful expertise on Australian herpetofauna, many of the quite properly named Wells and Wellington taxa simply do not get a mention.

Noting that Uetz markets his database as being a comprehensive resource for use by other herpetologists, Uetz is acting as an agent for the Wüster gang to engage in unscientific behaviour and actions in breach of the Zoological Code. The latter is due to the Wüster gang deliberately creating nomenclatural instability in terms of well-defined previously named reptile taxa, which will ultimately require intervention by the ICZN itself to stop the problem as seen already with varanid taxa (Hoser 2013).

But you will find on the same "The Reptile Database" all the "indicus" group species defined up to 2013 on the basis of an average of 1 per cent divergence, or for that matter the non-existent python taxa invented by Wulf Schleip in 2008 (3 non-species), for which the DNA evidence (with-held by Schleip himself in 2008, but reported by his friend O'Shea earlier in another publication) showed the alleged taxa didn't actually exist (see Hoser 2013 and sources cited therein for citations and details).

Noting the significant contribution to the systematics of varanid lizards in Australia by Wells and Wellington, it is with great pleasure that within this paper, I formally describe and name according to the Zoological Code (Ride *et al*. 1999), two new subspecies of Euprepiosaurus indicus (Daudin, 1802) from the Northern Territory and far north Queensland, named after each of these eminent herpetologists.

These are *Euprepiosaurus indicus wellsi subsp. nov.* and *Euprepiosaurus indicus wellingtoni subsp. nov.*.

Lesser Sunda *Empagusia* (*Dendrovaranus*) *salvator* (Laurenti, 1768), until now attributed to the subspecies *E. salvator bivittatus* (Kuhl, 1820), are herein described as a new subspecies, namely *E. salvator woolfi subsp. nov.*.

OTHER NEWLY NAMED VARANIDS FROM AUSTRALIA

Below I also formally name a new species of varanid from the Northern Territory, Australia, closely related to the north-west Australian species *Odatria glauerti* (Mertens, 1957), with which it has been confused until now. The new species is formally named as *Odatria hoserae sp. nov.* in recognition of the significant contributions to herpetology and wildlife conservation in general of my mother, Katrina Joan Hoser.

Another new species is named from the central east coast of Queensland, *Odatria* (*Honlamus*) *honlami sp. nov.*, this species having been until now confused with the more northern species *Odatria* (*Honlamus*) *semiremex* (Peters, 1869).

Within the subgenus *Honlamus subgen. nov.*, a group of Australian monitors within the genus *Odatria* Gray, 1838, I also herein formally describe and name the morphologically distinct population of *Odatria* (*Honlamus*) *mitchelli* from north-west Western Australia as a new subspecies, namely *Odatria* (*Honlamus*) *mitchelli hawkeswoodi subsp. nov.*.

The wide-ranging and variable species *Odatria tristis* (Schlegel, 1839) currently has two recognized subspecies, these being the Black-headed colour variant from south-western Australia, also found across central Australia to western Queensland (*O. tristis tristis*) and a colour variant without blackening of the head and neck from southern and eastern Queensland and generally strongly ocellated dorsal patterning, *O. tristis orientalis* (Fry, 1913). The unnamed form from the top-end of the Northern Territory and the Kimberley Ranges in northwest Western Australia is of a notably different colour scheme to the other two variants and so is herein described as a new subspecies *Odatria tristis nini subsp. nov.*.

The small varanid "*Varanus storri* Mertens, 1966", has been the subject of intense study by myself ever since I caught my first specimens in the Charters Towers cemetery in May 1977.

The Mount Isa specimens are considerably different morphologically to those from the granite belt of north eastern Queensland in the vicinity of Charters Towers and Townsville, including areas of suitable habitat north and south of this general area.

They do not match the specimens described as "*Varanus storri ocreatus* Storr, 1980" from Western Australia and so are herein described as a new subspecies, *Worrellisaurus storri makhani subsp. nov.*.

As an instruction to first or subsequent revisors of this work, no names proposed herein should have their spelling changed or altered in any way unless this is a mandatory requirement under the existing in force Zoological Code, as published by the ICZN. If emendation of names is in the normal course of events optional only, then the original spelling herein should be used, even if it appears to be of incorrect formation or gender.

LIVING SPECIES OF MONITOR

(presented in the four major evolutionary groupings or clades).

CLADE ONE

Tribe Varaniini *tribe nov.*

Genus *Varanus* Merrem, 1820

Type species: *Lacerta varia* Shaw, 1790.

Content: *Varanus varius* (Shaw, 1790) (type species); *V. komodoensis* Ouwens, 1912; *V. salvadorii* (Peters and Doria, 1878).

Subgenus *Papusaurus* Mertens, 1962.

Content: *Varanus* (*Papusaurus*) *salvadorii* (Peters and Doria, 1878) (monotypic).

Subgenus *Varanus* Merrem, 1820.

Type species: *Lacerta varia* Shaw, 1790.

Content: *Varanus* (*Varanus*) *varius* (Shaw, 1790) (type species); *V.* (*Varanus*) *komodoensis* Ouwens, 1912.

Genus *Pantherosaurus* Fitzinger, 1843.

Type species: *Varanus gouldii* (Gray, 1838).

Content: *Pantherosaurus gouldii* (Gray, 1838) (type species); *P. barryjonesi* (Wells and Wellington, 1985); *P. giganteus* (Gray, 1845); *P. kuringai* (Wells and Wellington, 1985); *P. mertensi* (Glauert, 1951); *P. panoptes* (Storr, 1980); *P. rosenbergi* (Mertens, 1957); *P. spenceri* (Lucas and Frost, 1903).

Subgenus *Aspetosaurus* Wells and Wellington, 1985.

Type species: *Varanus spenceri* Lucas and Frost, 1903.

Content: *Pantherosaurus* (*Aspetosaurus*) *spenceri* (Lucas and Frost, 1903) (monotypic).

Subgenus *Titanzius* Wells and Wellington, 1985.

Type species: *Hydrosaurus giganteus* Gray, 1845.

Content: *Pantherosaurus* (*Titanzius*) *giganteus* (Gray, 1845) (monotypic).

Subgenus *Aquativaranus subgen. nov.*

Type species: *Varanus mertensi* Glauert, 1951.

Content: *Pantherosaurus* (*Aquativaranus*) *mertensi* (Glauert, 1951) (monotypic).

Subgenus *Pantherosaurus* Fitzinger, 1843.

Type species: *Varanus gouldii* (Gray, 1838).

Content: *Pantherosaurus* (*Pantherosaurus*) *gouldii* (Gray, 1838) (type species); *P.* (*Pantherosaurus*) *barryjonesi* (Wells and Wellington, 1985); *P.* (*Pantherosaurus*) *kuringai* (Wells and Wellington, 1985); *P.* (*Pantherosaurus*) *panoptes* (Storr, 1980); *P.* (*Pantherosaurus*) *rosenbergi* (Mertens, 1957).

Genus *Odatria* Gray, 1838.

Type species: *Monitor tristis* Schlegel, 1838.

Content: *Odatria tristis* (Schlegel, 1838) (type species); *O. auffenbergi* (Sprackland, 1999); *O. glauerti* (Mertens, 1957); *O. glebopalma* (Mitchell, 1955); *O. kuranda* Wells and Wellington, 1985; *O. mitchelli* (Mertens, 1958); *O. orientalis* (Fry, 1913); *O. pengilleyi* Wells and Wellington, 1985; *O. pilbaraensis* (Storr, 1980); *O. scalaris* (Mertens, 1941); *O. semiremex* (Peters, 1869); *O. similis* (Mertens, 1958); *O. timorensis* (Gray, 1831); *O. tristis* (Schlegel, 1839); *O. hoserae sp. nov.*.

Subgenus *Kimberleyvaranus subgen. nov.*

Type species: *Varanus glebopalma* Mitchell, 1955.

Content: *Odatria (Kimberleyvaranus) glebopalma* (Mitchell, 1955) (monotypic).

Subgenus *Pilbaravaranus subgen. nov.*

Type species: *Varanus pilbarensis* Storr, 1980.

Content: *Odatria* (*Pilbaravaranus*) *pilbarensis* (Storr, 1980) (monotypic).

Subgenus: ***Honlamus subgen. nov.***

Type species: *Varanus (Odatria) semiremex* Peters, 1869.

Content: *Odatria* (*Honlamus*) *semiremex* (Peters, 1869) (type species); *O.* (*Honlamus*) *honlami sp. nov.*; *O.* (*Honlamus*) *mitchelli* (Mertens, 1958).

Subgenus *Odatria* Gray, 1838.

Type species: *Monitor tristis* Schlegel, 1838.

Content: *Odatria* (*Odatria*) *tristis* (Schlegel, 1838) (type species); *O.* (*Odatria*) *auffenbergi* (Sprackland, 1999); *O.* (*Odatria*) *glauerti* (Mertens, 1957); *O.* (*Odatria*) *kuranda* Wells and Wellington, 1985; *O.* (*Odatria*) *orientalis* (Fry, 1913); *O.* (*Odatria*) *pengilleyi* Wells and Wellington, 1985; *O.* (*Odatria*) *scalaris* (Mertens, 1941); *O.* (*Odatria*) *similis* (Mertens, 1958); *O.* (*Odatria*) *timorensis* (Gray, 1831); *O.* (*Odatria*) *tristis* (Schlegel, 1839); *O.* (*Odatria*) *hoserae sp. nov.*

Genus *Worrellisaurus* Wells and Wellington, 1983.

Type species: *Varanus acanthurus* Boulenger, 1885.

Content: *Worrellisaurus acanthurus* (Boulenger, 1885) (type species); *W. baritji* (King and Horner, 1987); *W. brachyurus* (Sternfeld, 1919); *W. brevicauda* (Boulenger, 1898); *W. bushi* (Aplin, Fitch and King, 2006), *W. caudolineatus* (Boulenger, 1885); *W. eremius* (Lucas and Frost, 1895); *W. gilleni* (Lucas and Frost, 1895); *W. kingorum* (Storr, 1980); *W. ocreatus* (Storr, 1980); *W. primordius* (Mertens, 1942); *W. storri* (Mertens, 1966).

Subgenus *Parvavaranus subgen. nov.*

Type species: *Varanus brevicauda* Boulenger, 1898.

Content: *Worrellisaurus* (*Parvavaranus*) *brevicauda* (Boulenger, 1898) (type species); W. (*Parvavaranus*) *eremius* (Lucas and Frost, 1895).

Subgenus *Arborhabitatiosaurus subgen. nov.*

Type species: *Varanus gilleni* Lucas and Frost, 1895.

Content: *Worrellisaurus* (*Arborhabitatiosaurus*) *gilleni* (Lucas and Frost, 1895) (type species); *W.* (*Arborhabitatiosaurus*) *bushi* (Aplin, Fitch and King, 2006); *W.* (*Arborhabitatiosaurus*) *caudolineatus* (Boulenger, 1885).

Subgenus *Worrellisaurus* Wells and Wellington, 1983.

Type species: *Varanus acanthurus* Boulenger, 1885.

Content: *Worrellisaurus acanthurus* Boulenger, 1885) (type species); *W. baritji* (King and Horner, 1987); *W. brachyurus* (Sternfeld, 1919); *W. kingorum* (Storr, 1980); *W. ocreatus* (Storr, 1980); *W. primordius* (Mertens, 1942); *W. storri* (Mertens, 1966).

CLADE 2

Tribe Empugusiini *tribe nov.*

Genus *Empagusia* Gray, 1838.

Type species: *Monitor flavescens* Hardwicke and Gray, 1827.

Content: *Empagusia flavescens* (Hardwicke and Gray, 1827) (type species); *E. bengalensis* (Daudin, 1802); *E. cumingi* (Martin, 1838); *E. dumerilii* (Schlegel, 1844); *E. marmoratus* (Wiegmann, 1834); *E. nebulosus* (Gray, 1831); *E. nuchalis* (Günther, 1872); *E. palawanensis* (Koch, Gaulke and Böhme, 2010); *E. rasmusseni* (Koch, Gaulke and Böhme, 2010); *E. rudicollis* (Gray, 1845); *E. salvator* (Laurenti, 1768); *E. togianus* (Peters, 1872).

Subgenus *Dendrovaranus* Mertens, 1942.

Type species: *Varanus rudicollis* Gray, 1845.

Content: *Empagusia* (*Dendrovaranus*) *rudicollis* (Gray, 1845) (type species); *E.* (*Dendrovaranus*) *cumingi* (Martin, 1838); *E.* (*Dendrovaranus*) *marmoratus* (Wiegmann, 1834); *E.* (*Dendrovaranus*) *nuchalis* (Günther, 1872); *E.* (*Dendrovaranus*) *palawanensis* (Koch, Gaulke and Böhme, 2010); *E.* (*Dendrovaranus*) *rasmusseni* (Koch, Gaulke and Böhme, 2010); *E.* (*Dendrovaranus*) *salvator* (Laurenti, 1768); *E.* (*Dendrovaranus*) *togianus* (Peters, 1872).

Subgenus *Empagusia* Gray, 1838.

Type species: *Monitor flavescens* Hardwicke and Gray, 1827.

Content: *Empagusia* (*Empagusia*) *flavescens* (Hardwicke and Gray, 1827) (type species); *E.* (*Empagusia*) *bengalensis* (Daudin, 1802); *E.* (*Empagusia*) *dumerilii* (Schlegel, 1844); *E.* (*Empagusia*) *nebulosus* (Gray, 1831).

CLADE 3

Tribe Shireenhosersauriini *tribe nov.*

Genus *Shireenhosersaurea gen. nov.*

Type species: *Monitor prasinus* Schlegel, 1839.

Content: *Shireenhosersaurea prasinus* (Schlegel, 1839) (type species); *S. beccarii* (Doria, 1874); *S. boehmei* (Jacobs, 2003); *S. bogerti* (Mertens, 1950); *S. keithhornei (*Wells and Wellington, 1985); *S. kordensis* (Meyer, 1874); *S. macraei* (Böhme and Jacobs, 2001); *S. reisingeri* (Eidenmüller and Wicker, 2005); *S. telenesetes* (Sprackland, 1991).

Genus *Oxysaurus gen. nov.*

Type species: *Varanus indicus spinulosus* Mertens, 1941.

Content: *Oxysaurus spinulosus* (Mertens, 1941) (monotypic).

Genus *Philippinosaurus* Mertens, 1959.

Type species: *Varanus grayi* Boulenger, 1885.

(a junior synonym of *Varanus olivaceus* Hallowell, 1856).

Content: *Philippinosaurus olivaceus* (Hallowell, 1856) (type species); *P. bitatawa* (Welton, Siler, Bennett, Diesmos, Duya, Dugay, Rico, Van Weerd and Brown, 2010); *P. mabitang* (Gaulke and Curio, 2001).

Genus *Euprepiosaurus* Fitzinger, 1843.

Type species: *Tupinambis indicus* Daudin, 1802.

Content: *Euprepiosaurus indicus* (Daudin, 1802) (type species); *E. cerambonensis* (Phillip, Böhme and Ziegler, 1999); *E. doreanus* (Meyer, 1874); *E. finschi* (Böhme, Horn and Ziegler, 1994); *E. jobiensis* (Ahl, 1932); *E. juxtindicus* (Böhme, Phillip, and Ziegler, 2002); *E. lirungensis* (Koch, Arida, Schmitz, Böhme and Ziegler, 2009); *E. melinus* (Böhme and Ziegler, 1997); *E. obor* (Weijola and Sweet, 2010); *E. rainerguentheri* (Ziegler, Böhme and Schmitz, 2007); *E. yuwonoi* (Harvey and Barker, 1998); *E. zugorum* (Böhme and Ziegler, 2005).

CLADE 4

Tribe Polydaedaliini *tribe nov.*

Genus: *Polydaedalus* Wagler, 1830.

Type species: *Lacerta nilotica* Linnaeus, 1766.

Content: *Polydaedalus niloticus* (Linnaeus, 1766); *P. ornatus* (Daudin, 1803); *P. pulcher* (Leach, 1819).

Genus *Psammosaurus* Fitzinger, 1826

Type species: *Tupinambis griseus* (Daudin, 1803).

Content: *Psammosaurus griseus* (Daudin, 1803) (monotypic).

Genus *Pachysaurus* Fitzinger, 1843.

Type species: *Tupinambis albigularis* Daudin, 1802.

Content: *Pachysaurus albigularis* (Daudin, 1802) (type species); *P. exanthematicus* (Bosc, 1792); *P. yemenensis* (Böhme, Joger and Schätti)**.**

GENUS *SHIREENHOSERSAUREA GEN. NOV.*

Type species: *Monitor prasinus* Schlegel, 1839.

Diagnosis: The genus *Shireenhosersaurea gen. nov.* are separated from all other living varanids by the following suite of characters: The tail is only moderately compressed or not at all; there is no obvious median double keel dorsally along the tail; the tail is round in section or somewhat dorso-ventrally compressed, at the most, very slightly laterally compressed in the last half; there is a median series of transversely enlarged supraocular scales.

The genus *Shireenhosersaurea gen. nov.* is further separated from other living varanids, including the so-called "*indicus* group" (Genus *Euprepiosaurus* Fitzinger, 1843), the group it is most closely related to, by the following suite of characters: a long tail being 1.75 times the snout-vent length, that is unique among the living varanids in being prehensile (and notably not seen in Genus *Euprepiosaurus* Fitzinger, 1843), and a mainly green or black colouration (the green being unique to this genus) and particular specializations of the foot to enable grasping on branches.

In common with *Euprepiosaurus*, *Shireenhosersaurea gen. nov.* species are characterized by having relatively long snouts, tails and legs.

Distribution: The centre of distribution for the genus is the island of New Guinea and nearby regions on the northern part of the Australasian plate.

Etymology: Named in honour of my magnificent wife, Shireen Hoser, in recognition for her immense contribution to herpetology worldwide. It is with great pleasure that I can name such incredibly beautiful species of monitor in honour of her.

Content: *Shireenhosersaurea prasinus* (Schlegel, 1839) (type species); *S. beccarii* (Doria, 1874); *S. boehmei* (Jacobs, 2003); *S. bogerti* (Mertens, 1950); *S. keithhornei (*Wells and Wellington, 1985); *S. kordensis* (Meyer, 1874); *S. macraei* (Böhme and Jacobs, 2001); *S. reisingeri* (Eidenmüller and Wicker, 2005); *S. telenesetes* (Sprackland, 1991).

GENUS *OXYSAURUS GEN. NOV.*

Type species: *Varanus indicus spinulosus* Mertens, 1941.

Diagnosis: *Oxysaurus gen. nov.* monotypic for the species "*Varanus indicus spinulosus* Mertens, 1941" is readily separated from all other living varanids by the following suite of characters: A high midbody scale row count in the vicinity of 210 scales; conical and pointed nasals; pink tongue; dorsum is dark brown with rows of yellow solid spots.

Oxysaurus gen. nov. is further diagnosed by the following characteristics: attaining about 100 cm in total length, in adults; the dorsal surface is a deep chocolate brown to black, which becomes tan below. Solid spots of lime green or yellowish form four broad transverse bands on the dorsum from shoulders to hips. Each band consists of four spots and the most anterior part of vertebral spots touch middorsally. Between these bands are numerous yellowish speckles, also arranged in transverse rows, forming distinct ocelli. The head is dorsally and laterally dark, lacking any light markings. The tongue is pink for its entire length. Limbs are dark brown, slightly speckled with yellow. The tail has light thin bands, with those on the distal two thirds only about two scales wide.

The snout of *Oxysaurus gen. nov.* is distinctly shorter, broader and higher than seen in species within the genus *Euprepiosaurus.* In *Oxysaurus gen. nov.* the head is 1.56 times longer than broad and 2.03 times longer than high, versus 1.7-2.2 and 2.4-3.2 in *E. indicus* (Pianka *et al.* 2004). The tail of *Oxysaurus gen. nov.* is not as strongly compressed as in *Euprepiosaurus.* The small scaled nature of *Oxysaurus gen. nov.* (about 210 mid-body rows) readily sets this genus apart from *Euprepiosaurus*, the genus it has been traditionally confused with.

Distribution: The monotypic genus is known only from two islands in the Solomon Islands group, namely San Jorge and Santa Ysabel (Mertens 1941, Sprackland 1993b). On Santa Ysabel the species *Oxysaurus spinulosus* (Mertens 1941) is found sympatrically with *Euprepiosaurus indicus* (Daudin, 1802).

Etymology: Named in honour of my now deceased Great Dane Dog, named "*Oxyuranus*" (Oxy for short), who over an eight year period ending in 2012, assisted Snakebusters, Australia's best reptiles shows in various capacities. This included to show children a love of all kinds of animals and also to guard the residence and facility of Snakebusters from illegal incursions by inexperienced imitators seeking to undermine and destroy the successful green business.

It was scandalous that the police-protected criminals were given immunity from prosecution by corrupt DSE officials who green-lighted them to commit any crimes they wanted. These crimes included unspeakable acts of animal cruelty, wildlife smuggling and other serious criminal offences.

In terms of his role in minimizing the commission of such offences against the Snakebusters wildlife, it is fitting that Oxy the Great Dane be honoured.

Furthermore, I note intense criticisms in the past of my naming species or genera in honour of animals, made by the animal-hating, truth-hating Wüster gang. I do not apologise at all for seeking to recognize the good works of non-human cohabitants of our biologically diverse planet.

By the way, *Oxyuranus* Kinghorn, 1923 is a well-known genus of Australasian elapid snake.

Content: *Oxysaurus spinulosus* (Mertens, 1941) (monotypic).

SUBGENUS *AQUATIVARANUS SUBGEN. NOV.*

Type species: *Varanus mertensi* Glauert, 1951.

Diagnosis: This subgenus within the genus *Varanus* is monotypic for the type species and is separated from all other living varanids by the following suite of characters: The tail is strongly laterally compressed, except at the base; with a distinct median double keel dorsally along the posterior half of the tail, this dorsal keel being exceptionally high; the caudal scales are

not arranged in regular rings, as in ventral scales are larger than the dorsal caudals; the nostrils are directed upwards.

The subgenus *Aquativaranus subgen. nov*. is further diagnosed as follows: The colour is a rich dark brown to black above, with numerous scattered tiny, light cream or yellow spots. The lower lip is speckled or barred with dark grey. Lower surfaces are white to yellowish, with grey mottling on the throat and a series of blue-grey cross-bars on the chest. Head scales are moderate, regular and smooth. Nostrils on the upper part of the snout are directed upwards, about twice as far from the eye as from the tip of the snout. 150-190 scales around the middle of the body. The strongly vertically compressed tail has a high dorsal medial keel that is about one and a half times as long as the head and the body. Posesses caudal scales with low keels, not in complete rings as the lower scales are larger than the upper scales. Grows to about a metre in total length, with exceptional specimens to nearly 1.5 metres in total length.

Distribution: Waterways of wet and dry tropical Australia, including those draining south in the region west of Cape York Peninsula in Queensland. Not known from New Guinea or Irian Jaya.

Etymology: Named in reflection of the water-dwellling nature of the monotypic type species.

Content: *Pantherosaurus* (*Aquativaranus*) *mertensi* (Glauert, 1951) (monotypic).

SUBGENUS *KIMBERLEYVARANUS SUBGEN. NOV.*

Type species: *Varanus* (*Odatria*) *glebopalma* Mitchell, 1955.

Diagnosis: The subgenus *Kimberleyvaranus subgen. nov.* within the genus *Odatria* is separated from all other living varanids by the following suite of characters: supraocular scales are subequal; the keels of the caudal scales are sometimes very strong, but never spinose; the tail is either round in section or somewhat dorsoventrally compressed, or at the very most, very slightly laterally compressed in the last half; there is no obvious median double keel dorsally along the tail; the scales on the top of the head are smooth; the tail is longer than the head and body, being well over twice as long as the head and body (unbroken and intact tail); tail pattern if present, is transversely aligned distally; the last half of the tail is a distinctive creamy white to yellow in colour; the tubercles on the lower surfaces of the feet are large and glossy being a very dark brown or black in colour.

The subgenus *Kimberleyvaranus subgen. nov*. is further defined as follows: Colouration is dorsally black with individually fawn coloured scales which form a reticulum on the flanks (where they predominate over the black) or small black centred ocelli on the midline (where black predominates). The top of the head and upper surfaces of the limbs are black with small cream or fawn flecks and spots, clustering to form larger spots on the limbs. The anterior half of the tail is mostly black above and the posterior half is a distinct creamy white to yellow in colour. The throat is white with a broad reticulum of light purplish fawn extending on to the sides of the throat, but forming bars on the lower lips. The belly and chest are white with indistinct transverse bars of light purplish fawn. The tail and limbs are creamy yellow below. Palms and soles have rounded shiny, very dark brown or black scales. The head scales are smooth, irregular and very small. The nostrils are much nearer to the tip of the snout than the eye and lateral in position. 130-170 scales around the middle of the body. Caudal scales are smooth or with low keels.

Distribution: Rocky habitats in tropical Australia from far western Queensland across to the West Kimberley in Western Australia.

Etymology: Named in reference to where the monotypic subgenus is known from and the centre of its present distribution.

Content: *Odatria (Kimberleyvaranus*) *glebopalma* (Mitchell, 1955) (monotypic).

SUBGENUS *PILBARAVARANUS SUBGEN. NOV.*

Type species: *Varanus pilbarensis* Storr, 1980.

Diagnosis: *Pilbaravaranus subgen. nov.* within the genus *Odatria* are separated from all other living varanids by the following suite of characters: supraocular scales are subequal; the keels of the caudal scales are sometimes very strong, but never spinose; the tail is either round in section or somewhat dorsoventrally compressed, at the very most very slightly laterally compressed in the last half; there is no obvious median double keel dorsally along the tail; the scales on the top of the head are smooth; the tail is longer than the head and body, tail pattern is irregularly and narrowly banded with dark reddish-brown and pale grey only; it is transversely aligned distally and pattern is consistent along the length of the tail; supraoculars gradually merging with larger interoculars; several ventro-lateral rows of moderately enlarged keeled scales on each side behind the vent, being more prominent in males; dorsal and caudal scales are feebly keeled; ground colour is reddish-brown; nostril latero-dorsal; snout-vent length is less than 180 cm in total.

Pilbaravaranus subgen. nov. is further diagnosed as follows: Pale to medium reddish-brown above, the head and neck being flecked with dark reddish-brown, sometimes forming irregular cross-bands on the neck. Back has pale-centred, dark brown spots tending to be aligned transversely. Limbs are spotted above. Tail is irregularly and narrowly banded with dark reddish-brown and pale grey. There is sometimes an obscure dark temporal streak. Venter is whitish with fine flecks or irregularly banded with grey. The head scales are small and smooth. The lateral-dorsal nostril faces upwards and outwards, being about half way between the eye and the tip of the snout. 110-135 scales around the mid-body. The tail is more-or-less round in cross-section without indication of a dorsal keel, being 1.7-2.1 times the length of the head and body. Dorsal and lateral caudal scales have low keels. Grows to about 50 cm in total length.

Distribution: Known only from the Pilbara region in Western Australia.

Etymology: Named in reference to the location it originates from.

Content: *Odatria* (*Pilbaravaranus*) *pilbarensis* (Storr, 1980) (monotypic).

SUBGENUS *HONLAMUS SUBGEN. NOV.*

Type species: *Varanus (Odatria) semiremex* Peters, 1869.

Diagnosis: The three species within the subgenus *Honlamus subgen. nov*., within the genus *Odatria*, are separated from all other living varanids by the following suite of characters:

One or other of the following three suites of characters:

1/ The last two thirds of the tail are moderately laterally compressed although it is rounded at the base; there is no obvious median double keel dorsally along the tail; the dorsal colouration is grey-brown with numerous scattered blackish flecks and small spots forming a fine reticulum over the dorsal surface or alternatively a pattern of flecks (*O. honlami sp. nov.*), or:

2/ The last two thirds of the tail are moderately laterally compressed although it is rounded at the base; there is no obvious median double keel dorsally along the tail; the colouration is a dark reddish-brown in dorsal colouration with a strong pattern of reddish-brown to white ocelli aligned transversely on the body and neck, including on the lower flanks of the sides (*O. semiremex*).

3/ The tail is strongly laterally keeled, except at the base; there is a distinct median double keel dorsally along the posterior half of the tail; the caudal scales are arranged in regular rings and sometimes incomplete on the sides of the tail; the tail is at least 1.3 times as long as the head and body; scales on the upper side of the basal portion of the tail are not rugose; scales on the head and body are fairly large; 40-60 scales across the top of the head from the angle of the mouth on one side to that of the

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other; 90-130 scales around the body (*O. mitchelli*).

Distribution: More or less continuously along the coastal strip of Australia from just south of Rockhampton in coastal Queensland, north to Cape York and then west to north-west Australia.

Etymology: The genus is named in honour of Mr Hon Lam, owner of the Park Orchards, Fish Cafe, for his magnificent efforts catering to the staff at Snakebusters, Australia's best reptiles displays over the best part of a decade preceding year 2013. People who work hard to give logistical support to front-line conservationists and educators should not have their efforts go unrecognized.

Content: *Odatria* (*Honlamus*) *semiremex* (Peters, 1869) (type species); *O.* (*Honlamus*) *honlami sp. nov.*; *O.* (*Honlamus*) *mitchelli* (Mertens, 1958).

SUBGENUS *PARVAVARANUS SUBGEN. NOV.*

Type species: *Varanus brevicauda* Boulenger, 1898.

Diagnosis: The subgenus *Parvavaranus subgen. nov.*, within the genus *Worrellisaurus*, are separated from all other living varanids by one or other of the following suites of characters:

1/ The tail is only moderately compressed or not at all; there is no obvious median double keel dorsally along the tail; the tail is round in section or somewhat dorso-ventrally compressed, at the most, very slightly laterally compressed in the last half; supraocular scales are subequal; the keels of the caudal scales are sometimes very strong, but never spinose; the tail is shorter than the head and body (*Worrellisaurus* (*Parvavaranus*) *brevicauda*), or:

2/ The tail is only moderately compressed or not at all; there is no obvious median double keel dorsally along the tail; the tail is round in section or somewhat dorso-ventrally compressed, at the most, very slightly laterally compressed in the last half; supraocular scales are subequal; the keels of the caudal scales are sometimes very strong, but never spinose; the tail is longer than the head and body; the scales on the top of the head are keeled, (*Worrellisaurus* (*Parvavaranus*) *eremius*).

Distribution: Arid areas of northern Western Australia, across the southern Northern Territory, to far western Queensland (for *Worrellisaurus* (*Parvavaranus*) *brevicauda*), or a slightly larger area, also including most of the northern two thirds of South Australia and nearby parts of inland south-east Western Australia (for *Worrellisaurus* (*Parvavaranus*) *eremius*).

Etymology: Named in reference to the small size of the component species.

Content: *Worrellisaurus* (*Parvavaranus*) *brevicauda* (Boulenger, 1898) (type species); W. (*Parvavaranus*) *eremius* (Lucas and Frost, 1895).

SUBGENUS *ARBORHABITATIOSAURUS SUBGEN. NOV.*

Type species: *Varanus gilleni* Lucas and Frost, 1895.

Diagnosis: The subgenus *Arborhabitatiosaurus subgen. nov.* within the genus *Worrellisaurus* are separated from all other living varanids by the following suite of characters: The tail is only moderately compressed or not at all; there is no obvious median double keel dorsally along the tail; the tail is round in section or somewhat dorso-ventrally compressed, and at the most, very slightly laterally compressed in the last half; supraocular scales are subequal; the keels of the caudal scales are sometimes very strong, but never spinose; the tail is longer than the head and body; the scales on the top of the head are smooth; the tail has longitudinal stripes or bars distally.

Distribution: Most drier parts of Australia, except the far north, the far south and the Murray/Darling basin of eastern Australia, including the dry region north of there, sometimes referred to as the "Brigalow Belt", which includes most of inland Queensland.

Etymology: Named in reflection of the tree-dwelling habits of the three widely recognized component species.

Content: *Worrellisaurus* (*Arborhabitatiosaurus*) *gilleni* (Lucas and Frost, 1895) (type species); *W.* (*Arborhabitatiosaurus*) *bushi* (Aplin, Fitch and King, 2006); *W.* (*Arborhabitatiosaurus*) *caudolineatus* (Boulenger, 1885).

ODATRIA HOSERAE SP. NOV.

Holotype: Specimen number R59658 from Leichhardt Mural, Death Adder Gorge, in the Northern Territory, Australia, Lat. -13.05, Long. 132.867 held at the Australian Museum in College Street, Sydney, NSW, Australia. The Australian Museum is a government owned facility that allows access to its collection holdings by herpetologists.

Diagnosis: Until now the species *Odatria hoserae sp. nov.* (within the subgenus *Odatria*) would key out as *O. glauerti* (Mertens, 1957) using published keys such as those in Cogger (1975) *et seq*..

However it is readily separated from that species by the following combination of colours. The dorsal ground colour is yellowish to rusty on the neck and shoulders, becoming blue-grey posteriorly on the trunk, grading to become black about halfway down the tail. Five to eight distinct or broken crossbands of light grey to turquoise oval spots are aligned transversely, with the colour intensifying posteriorly; these spots merge into bands on the tail base and become paler, white or bluish white rings that contrast sharply with the black distal tail. Black scales may border or outline the bands of spots posteriorly on the trunk. The pale markings present as distinct rows of spots. Limbs are dark grey or black with rows of pale yellow or white spots. The throat is white or yellow and the belly is pale grey and occasionally with indistinct crossbands. A very prominent dark temporal streak is bordered above and below by yellow or white. The iris of the eye is brown and the tongue pink. The tail is rounded in cross-section and the base is slightly depressed. Nostrils are lateral and slightly less than halfwaybetween the tip of the snout and the eye.

By contrast, *O. glauerti* can be separated from *Odatria hoserae sp. nov.* by one or other of the following character suites:
1/ grey to tan dorsal ground colour (West Kimberely *O. glauerti*), or;

2/ pale markings on the back are confluent and therefore appear as bands (East Kimberley *O. glauerti*).

O. glauerti and *Odatria hoserae sp. nov.* are separated from all other Australasian monitors by the following suite of characteristics:

Medium adult size up to 80 cm in total length; Gracile build, with a long neck and the tail that may exceed 1.8 times the body length; a black tail with brilliant white or bluish-white rings to the tip; neck and shoulders being grey to tan or yellowish to rusty in colour, the latter colour range being applicable to *O. hoserae sp. nov.;* a prominent black temporal stripe; an unmarked yellow or white throat; palms and soles with enlarged rubbery black scales.

Sweet (1999) details further differences between *O. glauerti* and *Odatria hoserae sp. nov.*, which he calls a West Arnhemland population of *O. glauerti*, including significant ecological differences between the two species taxa.

Distribution: At the present time, the species is known only from a population on the north-west edge of the Arnhem Land Sandstone Plateau and nearby outliers.

Etymology: Named in honour of my mother, Katrina Joan Hoser, who with her husband, Len Hoser, my father helped construct what was at it's time, a world-leading varanid breeding and research facility at the family home of 60 Arterial Road, St. Ives, NSW, Australia. This was in the 1970's and 1980's, being a facility visited by many of the world's biggest names in varanid research and taxonomy.

ODATRIA HONLAMI SP. NOV.

Holotype: Specimen number J46793 at the Queensland Museum, Brisbane, Queensland, Australia, originally caught at Gladstone in central coastal Queensland, Australia, Lat. -23.9,

Long. 151.3. The Queensland Museum is a government-owned facility that allows researchers access to their collection for research purposes.

Paratypes: Paratype 1: Specimen number R17965, at the Australian Museum, Sydney, NSW, Australia from Gladstone, Queensland, Australia, Lat. -23.9, Long. 151.3. The Australian Museum is a government-owned facility that allows researchers access to their collection for research purposes.

Paratypes 2-4: Specimens numbers, R17745, R17746 and R17938 at the Australian Museum, Sydney, NSW, Australia from Yeppoon, Queensland, Australia, Lat. -23.1, Long. 150.73. The Australian Museum is a government-owned facility that allows researchers access to their collection for research purposes.

Diagnosis: The species *Odatria honlami sp. nov.*, within the subgenus *Honlamus subgen. nov*. has until now been recognized as a variant of *Odatria semiremex* (Peters, 1869).

Odatria honlami sp. nov. is readily separated from *O. semiremex* by colouration. *O. honlami sp. nov.* is gray-brown in dorsal colouration with numerous scattered blackish flecks and small spots forming a fine reticulum over the dorsal surface or pattern of flecks. By contrast *O. semiremex* are dark reddish-brown in dorsal colouration and have a strong pattern of reddish-brown to white ocelli aligned transversely on the body and neck, including on the lower flanks of the sides. These distinct ocelli are not seen in *O. honlami sp. nov.*. In *O. honlami sp. nov.* the dorsal colouration is a lighter background colour covered with darker flecks conspicuously lacking the ocelli seen in *O. semiremex.* In *O. semiremex* the lower labials tend to form a pattern of brownish and creamish bars. By contrast in *O. honlami sp. nov*. the contrast between dark and light lower laibials is indistinct and hard to distinguish.

Both *O. semiremex* and *O. honlami sp. nov*. are separated from all other living varanids by the following suite of characters: The last two thirds of the tail are moderately laterally compressed although it is rounded at the base; there is no obvious median double keel dorsally along the tail; the colouration is one or other of: a gray-brown in dorsal colouration with numerous scattered blackish flecks and small spots forming a fine reticulum over the dorsal surface or pattern of flecks (*O. honlami sp. nov*.), or: a dark reddish-brown in dorsal colouration with a strong pattern of reddish-brown to white ocelli aligned transversely on the body and neck, including on the lower flanks of the sides (*O. semiremex*).

A typical specimen of *O. honlami sp. nov*. is depicted at the bottom of page 431 of Wilson and Swan (2013) or Pianka *et al.* (2004) on page 462.

Typical *O. semiremex* from Weipa in far north Queensland, is depicted at the top of page 320 of Wilson and Knowles (1988).

Distribution: Known only from Coastal Queensland in the region of Gladstone north to about Yeppoon. The species *Odatria semiremex* (Peters, 1869) is known from the vicinity of Townsville, North Queensland, northwards along the coast to the western side of Cape York, as well as nearby continental off-shore islands.

Etymology: The species is named in honour of Mr Hon Lam, owner of the Park Orchards, Fish Cafe, for his magnificent efforts catering to the staff at Snakebusters, Australia's best reptiles displays over the best part of a decade preceding year 2013. People who work hard to give logistical support to front-line conservationists and educators should not have their efforts go unrecognized.

ODATRIA* (*HONLAMUS*) *MITCHELLI HAWKESWOODI SUBSP. NOV.

Holotype: Specimen number R77001 at the Western Australian Museum, Perth Western Australia, collected at Mitchell Plateau, Western Australia, Lat. -14.9, Long. 125.8. The Western Australian Museum, Perth, Western Australia is a government-owned facility that allows researchers access to their collection for research purposes.

Paratypes: Specimen numbers R77144, R77409 and R77605 at the Western Australian Museum, Perth Western Australia, collected at Mitchell Plateau, Western Australia, Lat. -14.9, Long. 125.8. The Western Australian Museum, Perth Western Australia is a government-owned facility that allows researchers access to their collection for research purposes.

Diagnosis: The subspecies *Odatria* (*Honlamus*) *mitchelli hawkeswoodi subsp. nov.* has until now been treated as a regional variant of *O. mitchelli.* Were it not for the fact that distribution of *O. mitchelli* as recognized to the current date appears to be continuous across the coastal region from the east of the Northern Territory (the nominal form) to the west Kimberley (this subspecies) (this information taken from the literature cited above), I'd have described the Kimberley variant as a full species, noting that the Kimberley variant is readily distinguished from the type form on the basis of consistent colour and morphological differences as noted by previous authors including Pianka *et al.* (2004).

Odatria (*Honlamus*) *mitchelli hawkeswoodi subsp. nov.* is most easily separated from *O. mitchelli* on the basis of colouration. In *O. mitchelli* the dorsal colouration includes a patterning of yellow spots that have enlarged to have black centres, thereby forming *ocelli*, some of these running more than half of the body length (usually about 90 per cent). By contrast in *O. hawkeswoodi subsp. nov.* these *ocelli*, if present are only visible in the region of the front legs and they are not seen more than 50 per cent down the length of the body (usually only about 10 per cent).

Overall the dorsal colouration of *O. mitchelli hawkeswoodi subsp. nov.* is greyish to greyish-brown with a dorsal pattern consisting mainly of whitish yellow flecks, each typically consisting 2 to 4 scales; the throat and side of neck are whitish yellow with the throat itself a whitish colour. By contrast, the dorsal colouration of *O. mitchelli mitchelli* is an orangeish-brown colour, with a dorsal pattern consisting of a dark grey background, overlaid with a pattern consisting of orangeish-yellow ocelli merging into one another to give the back a somewhat reticulated pattern; the throat and side of the neck are a rich orangeish-yellow in colour, with the throat itself yellow.

Both *O. mitchelli mitchelli* and *O. mitchelli hawkeswoodi subsp. nov.* are separated from all other living varanids by the following suite of characters: The tail is strongly laterally keeled, except at the base; there is a distinct median double keel dorsally along the posterior half of the tail; the caudal scales are arranged in regular rings and sometimes incomplete on the sides of the tail; the tail is at least 1.3 times as long as the head and body; scales on the upper side of the basal portion of the tail are not rugose; scales on the head and body are fairly large; 40-60 scales across the top of the head from the angle of the mouth on one side to that of the other; 90-130 scales around the body.

Distribution: Restricted to the coastal parts of the Kimberley division of Western Australia.

Etymology: Named in honour of Dr. Trevor Hawkeswood of New South Wales in recognition of his immense contribution to the biological sciences in Australia and elsewhere, most notably that of invertebrates and beetles in particular.

ODATRIA* (*ODATRIA*) *TRISTIS NINI SUBSP. NOV.

Holotype: Specimen number R13637 at the Australian Museum, Sydney, NSW, Australia, from the East Alligator River, Northern Territory, Australia, Lat. -12.23, Long. 132.56. The Australian Museum, Sydney, NSW, Australia, is a government-owned facility that allows researchers access to their collection for research purposes.

Paratype: A specimen number R12377 at the Australian Museum, Sydney, NSW, Australia, from Yirrkala, via Darwin, Northern Territory, Australia, Lat. 12.25, Long. 136.88. The Australian Museum, Sydney, NSW, Australia, is a government-owned facility that allows researchers access to their collection for research purposes.

Diagnosis: Until now this subspecies has been classified as a

variant of *Odatria* (*Odatria*) *tristis orientalis*. The subspecies *Odatria tristis nini subsp. nov*. is readily separated from *O. tristis orientalis* by colour. *O. tristis nini subsp. nov*. is characterized by an orange or yellow coloured head, including the underside, which is yellowish in colour. By contrast, *O. tristis orientalis*, is characterized by either a greyish head, or if marked (as is commonly seen in juveniles) there are white light markings on the head, as opposed to yellowish in *O. tristis nini subsp. nov.*.

In *O. tristis tristis*, the head and neck are always black or dominantly blackish in colour, readily separating them from the other two subspecies. Specimens from western Queensland, intermediate in form and colour between *O. tristis tristis* and *O. tristis orientalis* are found. However at this stage, I know of no specimens intermediate in form between *O. tristis nini subsp. nov.* and either of the other subspecies.

While *O. tristis nini subsp. nov.* do have a dorsal pattern of ocelli as seen in *O. tristis orientalis*, it is considerably reduced in the subspecies *O. tristis nini subsp. nov.* as compared to *O. tristis orientalis*. Adult *O. tristis orientalis* have very distinct ocelli on the fore and hind body, however these are either faded, indistinct or absent in adult *O. tristis nini subsp. nov.*.

O. tristis orientalis are characterised by a thick dark temporal streak that runs through the eye and nearly to the nostril. By contrast in *O. tristis nini subsp. nov.* the temporal streak is reduced in thickness, length and intensity and does not run half way from the eye to the nostril.

O. tristis (all subspecies) are separated from all other living varanids by the following suite of characters:

Medium adult size up to 80 cm in total length; gracile build, with a longish neck and the tail that may exceed 1.8 times the body length; the last half of the tail does not have alternate black and white bands; neck and shoulders being grey to tan or yellowish to rusty in colour or even black, a fairly prominent black temporal stripe; an unmarked yellow or white throat; supraoculars are very small, sharply differentiated from the larger interoculars; males with a ventro-lateral cluster of strong spines on each side behind the vent.

Distribution: *O. tristis nini subsp. nov.* occurs in the top end of the Northern Territory and nearby parts of north-west Western Australia including the area stretching west from the western side of the Gulf of Carpentaria and offshore islands, such as Groote Eylandt and including the entire Kimberley Ranges of Western Australia.

O. tristis orientalis appears to be confined to most of Queensland, except the far west and nearby parts of north-west NSW and also except for the wettest parts.

O. tristis tristis appears to be found in most parts of arid Australia and the wetter south-west, where specimens are particularly dark, but not including most of the Murray-Darling basin.

Etymology: Named in honour of Dara Nin, of Ringwood, Victoria, Australia, in recognition of many years of excellent work with Snakebusters, Australia's best wildlife displays. To shatter a series of lies by inexperienced and ruthless competitors in the education business (see details below), Dara got bitten by a large venomoid Death Adder in public in late 2012 in Geelong in front of an audience of hundreds of people. This proved that the snake had no venom and shattered the lie that the snake had regenerated venom and was a danger to the public.

Other than the sizeable fang cuts in his arm, Dara was, as expected, totally unharmed.

Since taking this bite to prove the safety of Snakebusters shows and displays, including that Snakebusters are alone in their market with a perfect safety record, a number of competitors have had fatal and near fatal bites from venomous snakes occurring during their dangerous reptile displays. This is because they lacked the expertise to have surgically devenomized (venomoid) snakes.

While Snakebusters has an unmatched perfect safety record, spanning many years, the main business competitor of Snakebusters, the dysfunctional government-owned and controlled "Zoos Victoria", has an atrocious safety record involving many near fatal snake bites, mainly at Healesville Sanctuary, the majority of which have not been reported in the media. This is notable because "Zoos Victoria" are able to generate extensive favourable advertorial-type content in the tabloid papers daily as part of their government-backed advertising and self-promotion regime.

By way of example, Melbourne Zoo had a keeper killed by an elephant that was mistreated. This case of workplace manslaughter was kept of out of the media and no one was charged or fined for the criminal breaches of work safety laws.

Members of the public have been attacked and injured by rougue big cats and there have been a number of incidents involving escaped primates, and extreme animal cruelty at the Melbourne Zoo.

The Melbourne Zoo and the department that controls them, which regularly changes it's name, and as of mid 2013 is called the "Department of Environment and Primary Industries" (DEPI) improperly sits in the improper dual role of both regulator and business competitor of Snakebusters.

In that role, they have waged an illegal and damaging war against the Snakebusters reptile education business, by acting in direct breach of the Wildlife Act, Victoria, that they are supposed to be administering since at least 2006.

The criminal activity by these people has included illegal armed raids of Snakebusters, unlawful arrests of staff at gunpoint, destruction of property, killing of live snakes, fabricated criminal charges and so on.

Dara Nin, has had to endure numerous DEPI sponsored attacks on the business and himself. He has also done an excellent job of apprehending police-protected criminals who have attempted to steal reptiles and cause criminal damage.

In 2012, he did a magnificent job of foiling a DSE approved attack by newly licenced business competitors against one of our displays at Morwell. He did this by preventing Margaret Irvine Osborne and Bana Osbourne from successfully attacking a hands-on reptile display at a leisure expo. The two women are associates of protected criminals Michael Alexander and Sean McCarthy, both of whom had been allowed by police and DEPI to engage in illegal activity with immunity from protection for some years. Both men themselves run newly licenced and unsafe competing display businesses that also happen to operate regularly in breach of work safety laws in Victoria as well.

Like the dysfunctional "Zoos Victoria", McCarthy's reptile display and snake handling business, taken over from a Mr Simon Watharow, has a shocking safety record and had a number of incidents whereby a snake handler has had to be rushed to hospital after being inadvertently bitten by a highly venomous snake.

WORRELLISAURUS STORRI MAKHANI SUBSP. NOV.

Holotype: Specimen number: J32296 at the Queensland Museum, Brisbane, Australia, from Mount Isa in Queensland, Australia, Lat. -20.73, Long. 139.48. The Queensland Museum, Brisbane, Australia is a government-owned facility that allows researchers access to their collection for research purposes.

Paratype: Specimen number: J85595 at the Queensland Museum, Brisbane, Australia, from Mount Isa in Queensland, Australia, Lat. -20.73, Long. 139.48. The Queensland Museum, Brisbane, Australia is a government-owned facility that allows researchers access to their collection for research purposes.

Diagnosis: *Worrellisaurus storri makhani subsp. nov*. is readily separated from the nominate *W. storri storri* (Mertens, 1966) by colouration. The nominate form is characterized by a distinctive dark temporal streak running through the eye, being narrow between the nostril and the eye and broad beyond the eye,

where it forms a thick temporal streak running to the back of the head. By contrast in *Worrellisaurus storri makhani subsp. nov*. the same temporal streak is indistinct beyond the eye and it is not bounded by a white streak underneath, as it is in nominate *W. storri storri.*

Worrellisaurus storri ocreatus (Storr, 1980) in common with *Worrellisaurus storri makhani subsp. nov*. lacks a white lower boundary of the temporal streak beyond the eye. However *W. storri ocreatus* and nominate *W. storri storri* are readily separated from *W. storri makhani subsp. nov*. by the presence of dark flecks or spots below the temporal streak at the lower rear of the head. These are absent in *W. storri makhani subsp. nov*. or rarely present, but in contrast to the other two subspecies, these flecks or spots if present are very indistinct.

W. storri storri have white spots on dark limbs, while *W. storri ocreatus* have dark spots on orange-brown limbs. *W. storri makhani subsp. nov*. are separated from both by having orange-brown limbs with no flecks or spots or occasionally only very tiny and indistinct dark flecks.

All *W. storri* subspecies have a dorsal patterning that is in effect a matrix of darker and lighter scales, these usually being a combination of reddish-brown and grey-brown, or alternatively a yellowish or orangeish colour combined with the grey brown. Unlike the other two subspecies of *W. storri*, *W. storri makhani subsp. nov*. is diagnosed by the noticeably greater preponderance of darker scales than lighter scales on the flanks along the mid-sides of the body.

All subspecies of *W. storri* are separated from all other living varanids by the following suite of characters: A strongly spinose tail, round in section, without a median double keel along the dorsal surface, that is less than 1.8 times as long as the head and body; small adult size rarely exceeding 30 cm; a dorsal colouration that is usually reddish or orangeish brown, with numerous scattered dark brown or black scales, sometimes forming a reticulum, which is also seen sometimes on the upper surface of the limbs, with the reticulum pattern often reduced to flecks, or appearing that way, but never having a pattern of distinct ocelli; the head is usually flecked with blackish brown (see descriptions of subspecies above for the detail); lower surfaces and the lower sides of the neck are white or cream; 70-94 midbody scale rows; subequal supraocular scales

Distribution: Known only from the general vicinity of Mount Isa in far north-west Queensland.

Etymology: Named in honour of Dr. Dewanand Makhan of the Netherlands in recognition of his excellent work on the systematics of beetles.

EUPREPIOSAURUS INDICUS WELLSI SUBSP. NOV.

Holotype: A specimen from Maningrida, Northern Territory, Australia, Lat. -12.05° S, Long. 134.2167° E, specimen number R0347 at the Northern Territory Museum and Art Gallery, Darwin, NT, Australia. The Northern Territory Museum and Art Gallery, Darwin, NT, Australia, is a government owned facility that allows access to its collection holdings by herpetologists.

Paratype: A specimen at the Museum of Victoria, Melbourne, Australia, specimen number: DTD73 from Katji Lagoon, Arnhem Land, Northern Territory, Australia, Lat -12.35 S, Long. 134.78. The the Museum of Victoria, Melbourne, Australia is a government owned facility that allows access to its collection holdings by herpetologists.

Diagnosis: *Euprepiosaurus indicus wellsi subsp. nov.* is similar in most respects to the nominate form of *E. indicus.* However both are separated from *E. indicus wellingtoni subsp. nov.* (from Dauar and Murray Islands, Torres Strait, Queensland) by the nature of yellow speckling on the scales of the body, being no more than two scales of yellow in any one of the yellow spots. *E. indicus wellingtoni subsp. nov.* has yellow spots on the body of varying size, but some clearly in excess of two scales per yellow spots (typically four). Exceptional to this is the base of the tail of both forms, which may have patches of yellow (usually elongated) consisting of more than three yellow scales in sequence to form elongate markings.

The feature that most readily separates *E. indicus wellsi subsp. nov.* from the nominate form of *E. indicus* and *E. indicus wellingtoni subsp. nov.* is the large yellow patches on each of the toes on the forelimbs, consisting typically of several scales in width. By contrast in the other two subspecies the same yellow patches are reduced to tiny single scale spots.

Euprepiosaurus indicus wellsi subsp. nov. is also separated from all other *E. indicus* by the fact that the intensity of whitish yellow speckling reduces as one moves down the flanks of the body. In other *E. indicus* the intensity of speckling is consistent to the lower flanks.

E. indicus wellingtoni subsp. nov. currently only known from Dauar and Murray Islands, Torres Strait, Queensland, is separated from nominate *E. indicus* and *E. indicus wellsi subsp. nov.* by distinctly larger yellow spotting on the upper body and tail, including the head proper.

In *E. indicus wellingtoni subsp. nov.* the yellow markings on the head are so large as to appear as yellow spots. Along the jawline of *E. indicus wellingtoni subsp. nov.* are corresponding yellow patches on the upper and lower labials giving the appearance of about five distinct yellow bars across the lips. This condition is not seen in other *E. indicus* subspecies. In contrast to other *E. indicus*, in *E. indicus wellingtoni subsp. nov.* yellow spots on the back are typically in clusters of four scales, almost giving the lizard an ocellated appearance. Clusters of 2 to 5 scales in large yellow spots are present on the front and hind legs of *E. indicus wellingtoni subsp. nov.* which is in stark contrast to nominate *E. indicus* and *E. indicus wellsi sp. nov.* both of which have single yellow-scale spots (surrounded by dark grey to black scales).

In nominate *E. indicus* the upper neck is dark greyish black and with heavy white flecks. By contrast in *E. indicus wellsi sp. nov.* the upper neck is dark greyish black only, or rarely with a tiny amount of white or yellow flecks.

E. indicus, including all subspecies are separated from all other living varanids by the following suite of characters: The tail is strongly laterally compressed except at the base; a distinct low to moderate median double keel dorsally is along the posterior half of the tail; caudal scales are not arranged in regular rings, as ventral caudal scales are larger than the dorsal scales; nostrils directed laterally; a series of a few distinctly broader or enlarged scales among the supraoculars; the head is 1.7-2.2 times longer than broad and 2.4-3.2 times longer than high; 110-180 scales around the middle of the body.

A living *Euprepiosaurus indicus wellsi subsp. nov.* is depicted on the top of page 28 of Ziegler *et al.* (2001).

Distribution: Known only from the “top end” of the Northern Territory, Australia, where it is believed to be the only member of the *Euprepiosaurus indicus* species group present.

Etymology: Named in honour of Richard Wells of Lismore in New South Wales, Australia, in recognition of a lifetime’s work in herpetology in Australia, in this case with reference to his immense contribution to the systematics of the varanids in Australia, through his two publications of 1983 and 1985, namely Wells and Wellington (1983, 1985).

EUPREPIOSAURUS INDICUS WELLINGTONI SUBSP. NOV.

Type specimen: A specimen number R48078 at the Australian Museum in Sydney, NSW, Australia, from Dauar Island, Torres Strait, Queensland, Australia. The Australian Museum in Sydney, NSW, Australia, is a government owned facility that allows access to its collection holdings by herpetologists.

Diagnosis: *Euprepiosaurus indicus wellingtoni subsp. nov.* currently only known from Dauar and Murray Islands, Torres Strait, Queensland, is separated from nominate *E. indicus* and *E. indicus wellsi subsp. nov.* (from the Northern Territory) by distinctly larger yellow spots on the upper body and tail,

including the head proper.

In *E. indicus wellingtoni subsp. nov.* the yellow markings on the head are so large as to appear as yellow spots. Along the jawline of *E. indicus wellingtoni subsp. nov.* are corresponding yellow patches on the upper and lower labials giving the appearance of about five distinct yellow bars across the lips. This condition is not seen in other *E. indicus* subspecies. In contrast to other *E. indicus*, in *E. indicus wellingtoni subsp. nov.* yellow spots on the back are typically in clusters of four scales, almost giving the lizard an ocellated appearance. Clusters of 2 to 5 scales in large yellow spots are present on the front and hind legs of *E. indicus wellingtoni subsp. nov.* which is in stark contrast to nominate *E. indicus* and *E. indicus wellsi sp. nov.* both of which have single yellow-scale spots (surrounded by dark grey to black scales).

In nominate *E. indicus* the upper neck is dark greyish black and with heavy white flecks. By contrast in *E. indicus wellsi sp. nov.* the upper neck is dark greyish black only, or rarely with a tiny amount of white or yellow flecks.

E. indicus wellsi subsp. nov. is similar in most respects to the nominate form of *E. indicus.* However both are separated from *E. indicus wellingtoni subsp. nov.* (from Dauar and Murray Islands, Torres Strait, Queensland) by the nature of yellow speckling on the scales of the body, being no more than two scales of yellow in any one of the yellow spots. *E. indicus wellingtoni subsp. nov.* has yellow spots on the body of varying size, but some clearly in excess of two scales per yellow spots, in this subspecies the number being typically four. Exceptional to this is the base of the tail of all forms, which may have patches of yellow (usually elongated) consisting of more than three yellow scales in sequence to form elongate markings.

The feature that most readily separates *E. indicus wellsi subsp. nov.* from the nominate form of *E. indicus* and *E. indicus wellingtoni subsp. nov.* is the large yellow patches on each of the toes on the forelimbs, consisting typically of several scales in width. By contrast in the other two subspecies the same yellow patches are reduced to tiny single scale spots.

Euprepiosaurus indicus wellsi subsp. nov. is also separated from all other *E. indicus* by the fact that the intensity of whitish yellow speckling reduces as one moves down the flanks of the body. In other *E. indicus* the intensity of speckling is consistent to the lower flanks.

E. indicus, including all subspecies are separated from all other living varanids by the following suite of characters: The tail is strongly laterally compressed except at the base; a distinct low to moderate median double keel dorsally is along the posterior half of the tail; caudal scales are not arranged in regular rings, as ventral caudal scales are larger than the dorsal scales; nostrils directed laterally; a series of a few distinctly broader or enlarged scales among the supraoculars; the head is 1.7-2.2 times longer than broad and 2.4-3.2 times longer than high; 110-180 scales around the middle of the body.

A typical specimen of *E. indicus wellingtoni subsp. nov.* is depicted at the top of page 184 of Pianka *et al.* (2004).

Distribution: Known only from Dauar and Murray Islands in Torres Strait, Queensland, Australia, where it is believed to be the only member of the *Euprepiosaurus indicus* species group present.

Etymology: Named in honour of Cliff Ross Wellington of Woy Woy in New South Wales, Australia, in recognition of a lifetime's work in herpetology in Australia, in this case with reference to his immense contribution to the systematics of the varanids in Australia, through his two publications of 1983 and 1985, namely Wells and Wellington (1983, 1985).

EMPUGUSIA* (*DENDROVARANUS*) *SALVATOR WOOLFI SUBSP. NOV.

Holotype: A specimen at the State Museum of Natural History, Stuttgart, Germany, specimen number: SMNS Herpetologie 4463, from Nusa Tenggara Barat, Sumbawa, Indonesia.

Diagnosis: The subspecies *E. salvator woolfi subsp. nov.*. is similar in most respects to the subspecies, *E. salvator bivittatus* (Kuhl, 1820) with which it has been grouped until now and based on morphology, would as a matter of course be keyed out as this subspecies using existing texts on *E. salvator* subspecies (as seen for example in Pianka *et al.* 2004).

However *E. salvator bivittatus* is readily separated from *E. salvator woolfi subsp. nov*. by colouration. In *E. salvator bivittatus* the subspecies is separated from all other *E. salvator* by the presence along the sides of the neck behind the ear of a pronounced black band and under this a yellowish band, which in some cases may be divided into spots. By contrast in *E. salvator woolfi subsp. nov*. these bands are present but very indistinct. In other *E. salvator* these bands are not present.

In both nominate *E. salvator* and *E. salvator bivittatus* the generally greyish dorsal colour includes distinct large yellowish occelli, often tending to form large blotches or bands. These are effectively absent in *E. salvator woolfi subsp. nov*. with dorsal markings tending towards speckling or flecks only, the whitish parts usually consisting of just one or two scales and never as large occelli or large blotches as seen in nominate *E. salvator* and *E. salvator bivittatus.*

Both *E. salvator bivittatus* and *E. salvator woolfi subsp. nov*. are separated from other *E. salvator* by a labial pattern consisting of distinct alternating dark brown and lighter bars (usually 3 darker ones). In *E. salvator* this patterning is either not present or at best approaches this in a broken arrangement on the lower labials only, being two darker cross bars of irregular shape.

E. salvator and species similar to it, that being those which were until recently treated as being synonymous with it by most authors are separated from other living varanids by the following suite of characters: Nasal openings are roundish to oval and much closer to the tip of the snout than to the eye; the head is much longer (about two times) than it is broad; the long snout has a rounded tip and the tympanum is large; tail is 1.36-1.65 times the length of the snout-vent and is shorter in older specimens and longer in males; tail is also laterally compressed with a double-edged upper keel; head scales are relatively large, flat and smooth; 4-8 well-differentiated supraoculars and 48-60 scales from rictus to rictus in a straight line above head. Nuchal scales are smaller than the occipitals and the same size as or slightly larger than the dorsals. There are a total of 137-181 midbody scale rows and 80-95 ventral scale rows from the gular fold to the insertion of hind limbs. Normally on both sides, one to two well-differentiated preanal pores exist. The medium sized front limbs have strong and curved claws; the head is usually a dark grey colour and with some amount of whitish pattern.

Distribution: *E. salvator woolfi subsp. nov*. is known from the Lesser Sunda Islands of Indonesia, east of the Lombok Strait, including, Lombok, Sumbawa, Flores, Wetar, Atauro and adjacent islands, many not properly surveyed for varanids, in the northern arc.

It appears that the maritime barrier of the Lombok Strait (part of Wallace's Line) has allowed the populations east and west of the barrier to differentiate from one another through isolation, including during the most recent Pleistocene sea level falls which apparently did not cut off the Lombok Strait to join the land masses on either side.

Etymology: Named in recognition of Paul Woolf of Walloon, about 50 km west of Brisbane (by road) in Queensland, Australia, foundation president of the Herpetological Society of Queensland Incorporated (HSQI), for his contributions to herpetology, globally spanning more than 2 decades.

TRIBE VARANIINI *TRIBE NOV.*

Terminal taxon: *Lacerta varia* Shaw, 1790.

Now known as *Varanus varius* (Shaw, 1790).

Diagnosis: The monitors in the tribe Varaniini *tribe nov.* are separated from all other living varanids by the following suite of characters: Almost circular or oval nostrils that are closer to the

tip of the snout than the eye; a tail that may be either rounded or vertically compressed, with or without keels that is not prehensile; sharp recurved teeth in adults; importantly there are no median series of transversely enlarged supraocular scales or broadly enlarged supraoculars in any series or configuration.

Alternatively this tribe may be diagnosed by a process of eliminating the other three tribes as described in detail within this paper.

Distribution: Essentially confined to mainland Australia, this being the centre of distribution, with few species in the coldest parts of the south-east and a few species extralimital, being found on islands north of Australia, including the Lesser Sundas and New Guinea.

Content: *Varanus* Merrem, 1820 (type genus); *Pantherosaurus* Fitzinger, 1843; *Odatria* Gray, 1838; *Worrellisaurus* Wells and Wellington, 1983.

TRIBE POLYDAEDALIINI TRIBE NOV.

Terminal taxon: *Lacerta nilotica* Linnaeus, 1766.

Now known as *Polydaedalus niloticus* (Linnaeus, 1766).

Diagnosis: The three genera of monitors in the tribe Polydaedaliini *tribe nov.* are separated from all other living varanids by one or other of the following three suites of characters:

1/ Tail is laterally compressed and with a low dorsal crest; there are a total of 136-183 scales around the midbody; basic dorsal colour of adults is grey brown to olive brown with light yellow ocelli and bands on the head, back, limbs and tail; the belly and throat are paler and with black bars (*Polydaedalus* Wagler, 1830); or:

2/ Light brown to dark grey, with or without darker transverse bands on the back and tail; with or without yellow patches on the back; the nostrils are diagonal slits situated closer to the eyes than the tip of the snout; juveniles are vividly orange in colour with distinct transverse black bands on the back and tail; tail is rounded in cross-section or alternatively may be laterally compressed, especially distally and with a distinct keel on the back (*Psammosaurus* Fitzinger, 1826); or:

3/ Nares are almost equidistant between the eye and the tip of the snout and slit-shaped; large scales all over the body; stocky build, with a short tail (90-120 percent of snout-vent length) with a low double keel on the median third, and with a large head; supraoculars are not enlarged; other scales on top of the head are larger and irregularly-shaped, increasing in size and becoming more regularly oval-shaped and may or may not be flattened on the neck. Each nuchal scale is surrounded by clusters of small scales; scales on the dorsum have a pit on their smooth surface and one or two dark patches, most prominent on the hind legs and at the base of the tail; ventral scales are smooth, rectangular and regular; there are 81-103 scales around the body and 58-73 scales from the gular fold to the insertion of the hind limbs (*Pachysaurus* Fitzinger, 1843).

Distribution: Northern Africa, the Middle-east and drier parts of western Asia.

Content: *Polydaedalus* Wagler, 1830 (type genus); *Pachysaurus* Fitzinger, 1843; *Psammosaurus* Fitzinger, 1826.

TRIBE SHIREENHOSERSAURIINI *TRIBE NOV.*

Terminal taxon: *Monitor prasinus* Schlegel, 1839.

Now known as *Shireenhosersaurea prasinus* (Schlegel, 1839).

Diagnosis: Each of the four genera in Shireenhosersauriini *tribe nov.* are defined by one or other of the following four suites of characters:

1/ The tail is only moderately compressed or not at all; there is no obvious median double keel dorsally along the tail; the tail is round in section or somewhat dorso-ventrally compressed, at the most, very slightly laterally compressed in the last half; there is a median series of transversely enlarged supraocular scales (*Shireenhosersaurea gen. nov.*).

The genus *Shireenhosersaurea gen. nov.* is further separated from other living varanids, including the so-called "*indicus* group" (Genus *Euprepiosaurus* Fitzinger, 1843), the group it is most closely related to, by the following suite of characters: a long tail being 1.75 times the snout-vent length, that is unique among the living varanids in being prehensile (and notably not seen in Genus *Euprepiosaurus* Fitzinger, 1843 as described immediately below), and a mainly green or black colouration (the green being unique to this genus) and particular specializations of the foot to enable grasping on branches; or:

2/ The tail is strongly laterally compressed except at the base; a distinct low to moderate median double keel dorsally is along the posterior half of the tail; caudal scales are not arranged in regular rings, as ventral caudal scales are larger than the dorsal scales; nostrils directed laterally; a series of a few distinctly broader or enlarged scales among the supraoculars; the head is 1.7-2.2 times longer than broad and 2.4-3.2 times longer than high; 110-180 scales around the middle of the body (*Euprepiosaurus* Fitzinger, 1843); or:

3/ A high midbody scale row count in the vicinity of 210 scales; conical and pointed nasals; pink tongue; dorsum is dark brown with rows of yellow solid spots (*Oxysaurus gen. nov.*).

Oxysaurus gen. nov. is further diagnosed by the following characteristics: attaining about 100 cm in total length, in adults, the dorsal surface is a deep chocolate brown to black, which becomes tan below. Solid spots of lime green or yellowish form four broad transverse bands on the dorsum from shoulders to hips. Each band consists of four spots and the most anterior part of vertebral spots touch middorsally. Between these bands are numerous yellowish speckles, also arranged in transverse rows, forming distinct ocelli. The head is dorsally and laterally dark, lacking any light markings. The tongue is pink for its entire length. Limbs are dark brown, slightly speckled with yellow. The tail has light thin bands, with those on the distal two thirds only about two scales wide.

The snout of *Oxysaurus gen. nov.* is distinctly shorter, broader and higher than seen in species within the genus *Euprepiosaurus.* In *Oxysaurus gen. nov.* the head is 1.56 times longer than broad and 2.03 times longer than high, versus 1.7-2.2 and 2.4-3.2 in *E. indicus* (Pianka *et al*. 2004). The tail of *Oxysaurus gen. nov.* is not as strongly compressed as in *Euprepiosaurus.* The small scaled nature of *Oxysaurus gen. nov.* (about 210 mid-body rows) readily sets this genus apart from *Euprepiosaurus*, the genus it has been traditionally confused with; or:

4/ Slit-like nasal slits about halfway between the eye and the snout tip; greenish-grey, with seven or eight darker transverse bands on the body; tail is also banded transversely and laterally compressed with a dorsal crest; heads are large, light yellow and grey; claws are black, large and sharply curved and used in climbing; the teeth in young specimens are sharp, but in adults are distinctly blunt and used for the crushing of snails and similar items (*Philippinosaurus* Mertens, 1959).

Distribution: The region bounded by mainland south-east Asia to the west, then eastward to Australia in the east and including the islands between the two landmasses and islands to the north of the Australasian plate.

Content: *Shireenhosersaurea gen. nov.* (type genus); *Oxysaurus gen. nov.*; *Philippinosaurus* Mertens, 1959; *Euprepiosaurus* Fitzinger, 1843.

TRIBE EMPUGUSIINI *TRIBE NOV.*

Terminal taxon: *Monitor flavescens* Hardwicke and Gray, 1827.

Diagnosis: The monitors in the tribe Empugusiini *tribe nov.* are separated from all other living varanids by one or other of the following five suites of characters:

1/ Nostrils slit and closer to the tip of the snout than the eye; black, dark grey or brown in dorsal colour, with variable amounts of lighter pattern; nuchal scales are smooth, larger than mid-

dorsals and about the size of the posterior head scales; belly scales are smooth in 75-120 transverse rows (from gular fold to insertion of hind limb at its anterior edge); tail is laterally compressed with a double row of keeled scales dorsally (*E. bengalensis*; *E. nebulosus*); or:

2/ Short, broad head; transverse rows of more or less fused yellow spots on the dorsum; large and heavily keeled dorsal scales; relatively short toes and a relatively short tail (*Empagusia flavescens*); or:

3/ Enlarged scales on the neck that are not arranged in longitudinal rows; slit shaped nares closer to the eye than the snout and a brown body colour in adults (*E. dumerilii*); or:
4/ Enlarged, compressed, strongly keeled scales arranged in longitudinal rows on the neck; long narrow snout; slit shaped nares closer to the eye than the tip of the snout; black body colour (*E. rudicollis*); or:

5/ Nasal openings are roundish to oval and much closer to the tip of the snout than to the eye; the head is much longer (about two times) than it is broad; the long snout has a rounded tip and the tympanum is large; tail is 1.36-1.65 times the length of the snout-vent and is shorter in older specimens and longer in males; tail is also laterally compressed with a double-edged upper keel; head scales are relatively large, flat and smooth; 4-8 well-differentiated supraoculars and 48-60 scales from rictus to rictus in a straight line above head. Nuchal scales are smaller than the occipitals and the same size as or slightly larger than the dorsals. There are a total of 137-181 midbody scale rows and 80-95 ventral scale rows from the gular fold to the insertion of hind limbs. Normally on both sides, one to two well-differentiated preanal pores exist. The medium sized front limbs have strong and curved claws; the head is usually a dark grey colour and with some amount of whitish pattern (*E. salvator*, *E. marmoratus*; *E. nuchalis*; *E. palawanensis*; *E. rasmusseni*; *E. togianus*).

Distribution: Indonesia and southern Asia.

Content: *Empagusia* Gray, 1838.

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CONFLICT OF INTEREST

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

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