Australasian Journal of Herpetology **37:24-37.**
Published 20 June 2018.

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

Six new species of Dwarf Goanna, *Worrellisaurus* Wells and Wellington, 1984 from Australia.

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Received 19 May 2018, Accepted 3 June 2018, Published 20 June 2018.

ABSTRACT

As part of a long-term taxonomic review of Australian varanid lizards by the author over a 40 year period, it has emerged that some morphologically distinct and genetically divergent forms of some species of widely distributed Pygmy Monitors of the genus *Worrellisaurus* Wells and Wellington, 1984 remain unrecognized to science.

The purpose of this paper is to identify and formally name six of these forms.

All newly named species can be readily identified and separated from the nominate form of each closely related species on the basis of morphology. Furthermore previously published studies involving the analysis of DNA has shown species-level divergences for the relevant forms.

In terms of the divergence by way of DNA, earlier studies have shown divergences for each of the five newly named forms being greater than for other well-known and widely accepted taxa, such as *Worrellisaurus bushi* (Aplin, Fitch and King, 2006) versus *W. gilleni* (Lucas and Frost, 1895) (its nearest relative) or *Pantherosaurus flavirufus* (Mertens, 1958) versus *P. gouldi* (Gray, 1838) (its nearest relative).

It is for this reason I have not hesitated to recognise each taxon as full species, rather than to take the conservative position of giving them taxonomic recognition at the subspecies level.

I have no doubt that a group of thieves known as the Wüster gang, will make a lot of "noise" following the publication of this paper and falsely accuse this author of "taxonomic vandalism", and then a few years down the track, when the obvious can no longer be ignored, they will attempt to steal this work and illegally rename the very same species.

The genus-level taxonomy used in this paper is that used in Hoser (2013), which as of 2018 is widely accepted by scientists as the most logical for the Australian varanids and is fully compliant with the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

Keywords: Taxonomy; nomenclature; Goanna; Monitor lizard; Varanidae; *Varanus*; *Worrellisaurus*; *Arborhabitatiosaurus*; Pygmy Mulga Goanna; Storr's Monitor; Ridge-tailed monitor; South Australia; Northern Territory; Western Australia, Queensland, Australia; *acanthurus*; *storri*; *ocreatus*; *makhani; gilleni*; *bushi*; new species; *kimaniadilbodeni*; *microocellata*; *tyeseeipperae*; *scotteipperi*; *dannybrowni*; *jenandersonae*.

INTRODUCTION

As part of a long-term taxonomic review of Australian varanid lizards by the author over a 40 year period, the genus-level classification of the varanidae globally was reviewed and revised by Hoser (2013).

This classification has been widely accepted in the five years since then, including by regular critics of my scientific works known as the Wüster gang of thieves, who have even sought to illegally rename genera first formally named in the Hoser (2013) paper in Bucklitsch *et al.* (2016) as detailed by Hoser (2017).

Therefore the genus-level classification of Hoser (2013) is used throughout this paper.

The nefarious and often illegal activities of the Wüster gang of thieves are detailed in Hoser (2015a-f) and sources cited therein.

Post year 2000 papers naming new taxa of Australian varanid include the following: Doughty *et al.* (2014), Hoser (2013, 2014, 2015g), Maryan *et al.* (2014).

The post year 2000 varanid taxa named in Australia by these authors (using the nomenclature of Hoser 2013) are sixteen species and subspecies-level taxa as follows:

Worrellisaurus (*Arborhabitatiosaurus*) *bushi* (Aplin, Fitch and King, 2006);

Odatria (*Odatria*) *hoserae* Hoser, 2013;

Odatria (*Honlamus*) *honlami* Hoser, 2013;

Odatria (*Honlamus*) *mitchelli hawkeswoodi* Hoser, 2013;

Worrellisaurus (*Worrellisaurus*) *makhani* (Hoser, 2013) (originally described by Hoser (2013) as a subspecies of *W. storri* (Mertens, 1966);

Odatria (*Odatria*) *tristis nini* Hoser, 2013;

Euprepiosaurus indicus wellsi Hoser, 2013;

Euprepiosaurus indicus wellingtoni Hoser, 2013;

Odatria (*Kimberleyvaranus*) *glebopalma funki* Hoser, 2014;

Odatria (*Kimberleyvaranus*) *glebopalma maderi* Hoser, 2014;

Odatria (*Pilbaravaranus*) *hamersleyensis* (Maryan, Oliver, Fitch and O'Connell, 2014);

Worrellisaurus (*Parvavaranus*) *sparnus* (Doughty, Keally, Fitch and Donnellan, 2014);

Pantherosaurus (*Aspetosaurus*) *maxhoseri* Hoser, 2015;

Worrellisaurus (*Worrellisaurus*) *primordius dalyi* Hoser, 2015;

Pantherosaurus (*Titanzius*) *giganteus queenslandensis* Hoser, 2015;

Pantherosaurus (*Titanzius*) *giganteus bulliardi* Hoser, 2015.

Non-Australian varanid taxa have been formally described and named by Hoser (2013) and other authors in the same post 2000 period.

In spite of this effort, it has also emerged that some seven morphologically distinct and genetically divergent forms of some species of widely distributed Pygmy Monitors of the genus *Worrellisaurus* Wells and Wellington, 1984 remain unrecognized to science, as do other Australian taxa.

As it happens, these would have been named many years ago were it not for a series of extremely damaging interruptions to our research effort, by money grabbing thieves, whose agenda is more along the lines of destruction for profit, rather than public benefit or science as detailed by Court of Appeal, Victoria (2014), Victorian Civil and Administrative Tribunal (VCAT) (2015), Hoser (1993, 1995, 1996, 1999a and 1999b).

Events detailed by Court of Appeal, Victoria (2014), Victorian Civil and Administrative Tribunal (VCAT) (2015), Hoser (1989, 1991, 1993, 1995, 1996, 1999a and 1999b, 2000a, 2000b) included illegal armed raids and unlawful thefts of research files, which caused irreparable harm to numerous research projects by the theft of records, photos and data that took many decades of hard work to accumulate.

While it would be preferable to either retrieve the stolen material or to replicate earlier research and accumulation of data, neither are likely to happen in my lifetime.

In terms of the former, corrupt wildlife officers and police who illegally took materials have refused to return them in spite of numerous court orders to do so. In terms of the latter, I am now aged 56 years of age, and am not likely to live another 40 years in good health to be able to go around the same parts of northern Australia collecting and recording species, as done in the previous 40 years.

As it is critically important that unnamed species be formally identified and named as the vital first step in their long-term conservation, I have absolutely no hesitation in describing the new to science forms herein, even though my available material and data is nowhere near as extensive as I would like it to be.

As stated in the abstract, the purpose of this paper is to identify and formally name six of these seven known undescribed varanid forms from northern parts of Australia.

The seventh form, most closely related to *Worrellisaurus kingorum* Storr, 1980 is named in a separate paper published at the same time as this one.

At the same time these papers are published, another formally names a new species in the *Odatria glauerti* (Mertens, 1957) species complex, this being in addition to *O. hoserae* Hoser, 2013, while yet another paper names a new taxon in the *Odatria* (*Kimberleyvaranus*) *glebopalma* (Mitchell, 1955) species complex.

All newly named species can be readily identified and separated from the nominate form of each closely related species on the basis of morphology. Furthermore previously published studies involving the analysis of DNA within the last decade by other authors, including as cited in Hoser (2013), including Fitch *et al.* (2006), has shown species-level divergences for the relevant forms.

In terms of the divergence by way of DNA, earlier studies including Fitch *et al.* (2006) have shown divergences for each of the five newly named forms being greater than for other well-known and widely accepted taxa, such as *Worrellisaurus bushi* (Aplin, Fitch and King, 2006) versus *W. gilleni* (Lucas and Frost, 1895) (its nearest relative) or *Pantherosaurus flavirufus* (Mertens, 1958) versus *P. gouldi* (Gray, 1838) (its nearest relative).

It is for this reason I have not hesitated to recognise each taxon as full species, rather than to take the conservative position of giving them taxonomic recognition at the subspecies level.

I have no doubt that a group of thieves known as the Wüster gang, will make a lot of "noise" following the publication of this paper and falsely accuse myself of "taxonomic vandalism", and then a few years down the track, when the obvious can no longer be ignored, they will attempt to steal this work and illegally rename the very same species.

The same gang will allege I have no experience at all with the said taxa and that all my evidence is either "non-existent", "fabricated" or "stolen", (see for example Kaiser (2012a, 2012b, 2013, 2014a, 2014b) and Kaiser *et al.* (2013), the latter "paper" perhaps should be better known as "Wüster and others he can "add" to his authors list".

As stated already, the genus-level taxonomy used in this paper is that used in Hoser (2013), which as of 2018 is widely accepted by scientists as the most logical for the Australian varanids and is also fully compliant with the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

MATERIALS, METHODS AND RESULTS

The basis of this long-term study has been the inspection of numerous specimens, live, in jars in museums and via photos with accurate locality data, as well as a perusal of the limited published literature on putative species within the genus *Worrellisaurus* Wells and Wellington, 1984.

In terms of the species "*Varanus kingorum* Storr, 1980" it was confirmed that two taxa are involved.

They are dealt with in a separate paper and so for the purposes of this paper are ignored.

However so readers can locate that paper by way of internet search, and locate the newly named species, I can state that it is named in honour of Stuart and James Bigmore of Lara (Geelong), Victoria, Australia and the description is published in the same journal as this and on the same date.

I have also collected the relevant regions in Australia, including caught *in situ* the species formally described herein.

This is all mentioned here, even though it could be described as trite.

However none of the inevitable claims by the haters as already mentioned are in fact the case.

Obviously I should note that morphological divergence on its own is not regarded by myself as sufficient grounds to assign a new species.

However there are other important grounds. All populations are separated by zones of clearly unsuitable habitat and are therefore reproductively isolated. Having said that, for some of the named species, geographic species boundaries between these species and others is not always clear at this stage.

Five of the six relevant species populations are strictly saxacoline (rock dwelling) in habits and so the species boundaries are easily inferred.

The sixth newly identified species is of a tree-dwelling complex (subgenus *Arborhabitatiosaurus* Hoser, 2013) in central and western Australia and its range is broken by areas of unsuitable habitat in the form of treeless plains, gibber, and dunes and again, ascertaining exact species boundaries would not be too difficult if and when Australian governments spent funds on things such as this rather than starting very expensive wars in third-world countries and spending up to $50 billion dollars on a single submarine that does not even run properly!

The three species groups from where the six new species are derived are as follows:

1/ The *Worrellisaurus storri* (Mertens, 1966), group (4 new species),

2/ The *Worrellisaurus acanthurus* (Boulenger, 1885) group (1 new species)

3/ The *Worrellisaurus* (*Arborhabitatiosaurus*) *gilleni* (Lucas and Frost, 1895) group (1 new species).

In terms of W. *storri*, the following points are noted. Hoser (2013)

described a form from Mount Isa in north-west Queensland as a new subspecies, namely "*Worrellisaurus storri makhani*" at pages 51 and 52.

Previous to this, in 1980, Storr described as a subspecies "*Varanus storri ocreatus*" at pages 283-285.

Storr's original description and diagnosis was intended to apply only to Western Australian specimens until then referred to as "*Varanus storri*" as those from immediately adjacent far north-west Northern Territory.

The most readily identifiable difference between the West Australian and eastern Queensland specimens of "*Varanus storri*" was tail length, with it being significantly longer in West Australian specimens.

Storr's division of the east and west Australian "*Varanus storri*", was accepted by subsequent authors such as Wilson and Knowles (1988) and more recently Cogger (2017), both of whom treated both forms as subspecies in the way Storr had intended.

In years following Storr's (1980) description, it became clear that specimens more recently found at Mount Isa and nearby parts of Western Queensland and adjacent Northern Territory conformed morphologically more to the West Australian forms (at least by way of average proportional length of the tail being longer) than to those from eastern Queensland and so they too were referred to as "*V. storri ocreatus*" by numerous authors including Wilson and Swan (2017).

Hoser (2013) decided that the specimens from north-west Queensland near Mount Isa conformed to neither and so conservatively described them as a subspecies of "*V. storri*", but placing all in the genus *Worrellisaurus* Wells and Wellington, 1984.

Significantly and inadvertently overlooked by Hoser (2013) was the locality data for the DNA for the "*Varanus storri*" samples analysed by Fitch *et al.* (2006).

Their "*Varanus storri ocreatus*" samples were both from Western Australia, whereas their (alleged) "*Varanus storri storri*" samples were in fact from Mount Isa.

The divergence between the two was greater than that between other species of monitor. Therefore it cannot be credibly denied that Mount Isa "*Varanus storri*" are in fact a different species to the West Australian ones. As both are more alike one another than they are to the East Queensland "*Varanus storri*", all three must therefore be of different species!

This is in fact confirmed by the molecular phylogeny published by Thompson *et al.* (2008), who found their "*V. storri* WA" divergent from all of their "*V. storri* Qld", "*V. baritji*", "*V. acanthurus* WA" and "*V. acanthurus* NT", which formed a separate clade entirely. I should also mention that their "*V. storri* Qld" sample was from Mooranbah in north-east Queensland, being of the so-called nominate "*V. storri*" population.

Based on a merging of the molecular data of both Fitch *et al.* (2006) and Thompson *et al*. (2008), the unavoidable reality is that the three described subspecies of "*V. storri*", (treated here as *Worrellisaurus*) must be recognized as full species!

Hence each should be known as the following: *W. storri* (Mertens, 1966), *W. ocreatus* (Storr, 1980) and *W. makhani* (Hoser, 2013).

Significantly, both the published phylogenies of Fitch *et al.* (2006) and Thompson *et al*. (2008), showed the "*W. ocreatus*" lineage as being basal to the rest and within this group of species, it clearly being derived from the Kimberley district of Western Australia, where two ancient and geographically proximal lineages were identified by Fitch *et al.* (2006).

One of those lineages remains unnamed and so it is formally described as a new species within this paper.

A third morphologically divergent Kimberley population from the central and north Kimberley is also formally named as a new species for the first time.

Another divergent population referred to as "*W. ocreatus*" from the Gregory National Park area of the Northern Territory is also formally named herein as a new species.

All four of the previously referred to taxa from the Kimberley and adjacent areas in the Northern Territory can be easily separated from one another by consistent character differences.

In terms of the western Queensland specimens until now treated as "*W. storri*", it is evident that there are two disjunct and morphologically divergent populations that are also clearly reproductively isolated. One is already named, herein regarded as the species *W. makhani* Hoser, 2013 with a type locality of Mount Isa. The other from rocky areas on the NT side of the Gulf of Carpentaria, is formally named for the first time.

These animals have until now been variously described in the recent past as "*Varanus storri ocreatus*" by Brown (2014), or as a monitor "with characters intermediate between *V. storri* and *V. primordius*" by Bennett (1998).

While this paper presents the irrefutable evidence to confirm that *W. ocreatus* is a full species and that this is confirmed by the molecular phylogeny of both Fitch *et al.* (2006) and Thompson *et al.* (2008), it is also appropriate to mention that the first herpetologists to get this fact correct in a publication were the much lampooned and attacked Wells and Wellington. These two men in both Wells and Wellington (1984) and Wells and Wellington (1985) got the classification correct and were effectively ignored until Hoser (2013) revisited the obvious facts and molecular evidence not available to Wells and Wellington in 1985 to confirm they had been correct all along.

Hoser (2007) also publicly alerted the herpetological community that it was time to grudgingly accept that the works of Wells and Wellington (1984, 1985) were largely correct and not a severe case of taxonomic vandalism as alleged by the Wüster gang of thieves over the preceding two decades.

Significantly, Fitch *et al.* (2006) and Thompson *et al.* (2008) also confirmed the genus level classification of the relevant species (*Worrellisaurus*) as originally determined by Wells and Wellington (1984 and 1985) to also be appropriate.

In reality Wells and Wellington (1984, 1985) had stated what at all materially relevant times had been blatantly obvious to anyone who cared to look!

The species best known as the "Ridge-tailed Monitor" or "*Varanus acanthurus* Boulenger, 1885", also now treated as being within the genus *Worrellisaurus*, has been subdivided into various subspecies, namely "*Varanus acanthurus acanthurus* Boulenger, 1885", "*Varanus acanthurus brachyurus* Sternfeld, 1919" and "*Varanus acanthurus insulanicus* Mertens, 1958", as well as another closely related taxon, formerly treated as "*Varanus acanthurus acanthurus* Boulenger, 1885", now usually known as "*Varanus baritji* King and Horner, 1987". These have type localities from various parts of northern and central Australia and clustered into two species groups in the phylogeny of Fitch *et al.* (2006). The two forms from the top end of the Northern Territory, namely "*Varanus acanthurus insulanicus* Mertens, 1958" and "*Varanus baritji* King and Horner, 1987" were minimally divergent, meaning that the latter should be treated either as a synonym of the former, or at best a subspecies of it.

In terms of the other two taxa, there was a similar result for the nominate forms of each. However a divergent lineage listed by Fitch *et al.* (2006) as "*V. acanthurus acanthurus*", was identified. It was of species-level divergence and conformed to the until now unnamed population from the area of the southern Pilbara region in Western Australia.

The type locality of "*Varanus acanthurus* Boulenger, 1885" (and by Gray, 1845) was given as the north-west coast of Australia.

However no exact location was given, leading an element of doubt until now as to from where the type material came from.

What is however certain is where it did not come from!

The holotype and descriptions by Gray (1845) and Boulenger (1885) both conform to specimens from the Kimberley region of Western Australia, particularly with regard to Boulenger's reference to colouration of all available specimens.

Boulenger (1885) described the colour for the species as follows: "Blackish, with large yellow rings; limbs and tail yellow-spotted; a black and yellow temporal streak; neck sometimes with black and yellow longitudinal streaks; lower surfaces yellowish, the throat dotted with blackish."

The southern Pilbara lineage is of a different colouration and therefore, assuming it to be of a different taxon to Boulenger's

taxon, remains unnamed until now. It is therefore described herein as a new species.

The Pygmy Mulga Goanna most commonly known as "*Varanus gilleni* Lucas and Frost, 1895" occurs in central parts of Australia, including arid areas of South Australia, extending in South Australia almost to the Great Australian Bight.

Hoser (2013) confirmed the generic placement for the putative taxon into the genus *Worrellisaurus* Wells and Wellington, 1984 based on morphological and molecular divergence of the relevant species group.

Wells and Wellington (1984) carried a publication date of 1983 on the cover, but the paper apparently appeared in 1984, giving rise to confusion by many authors as to the year attributed to the name.

The purpose of this paper is to formally name the divergent population from the south as a new species similar to and related to "*Worrellisaurus gilleni* Lucas and Frost, 1895", namely *Worrellisaurus jenandersonae sp. nov*.

The new species *W. jenandersonae sp. nov*. is according to the molecular data of Fitch *et al*. (2006) more divergent from *W. gilleni* than *W. gilleni* is from *W. bushi* (Aplin, Fitch and King, 2006), which is why I have not hesitated to accord this new taxon species-level recognition.

In terms of the important bibliographic references for the species dealt with herein, refer to those in Hoser (2013) and sources cited therein. They are not relisted herein, unless cited elsewhere in this paper.

In terms of the descriptions herein, it should be noted that as for all similar papers published by myself, they are part of the permanent scientific record and should be treated accordingly. This also includes in terms of all relevant zoological nomenclature, as dictated by the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

No scientific names formally assigned herein should be altered in any way, unless absolutely mandatory under the rules of the *International Code of Zoological Nomenclature.*

In the unlikely event that a second reviser seeks to merge one or more newly named taxa, then the name to be used and retained is that of order of publication herein, that being page priority, or as the new names are listed in the abstract.

To conform with the relevant provisions of the *International Code of Zoological Nomenclature* material within given species descriptions may be repeated in subsequent ones in this paper and I make no apologies for this.

It also should be mentioned that in terms of all the newly named species within this paper, I have checked the relevant original species descriptions for related taxa, with particular reference to holotype material as listed in Cogger *et al.* (1983) or other relevant sources as cited in Hoser (2013) and this paper and confirmed that the newly named species are not synonyms of previously named forms.

In terms of the newly named species within the subgenus *Worrellisaurus* Wells and Wellington, 1983, as defined by Hoser (2013), I briefly outline where each comes from and also from where the species they were previously assigned to are found.

W. primordius (Mertens, 1942), occurs at the top end of the Northern territory. South of the Daly River in the west of the species range is the subspecies *W. primordius dalyi* Hoser, 2015.

W. storri (Mertens, 1966) is found in north-east Queensland, west of Croydon, Queensland.

W. ocreatus (Storr, 1980) as defined herein occurs in the rocky areas of the lower Ord River drainage, in far north-west Western Australia, in the East Kimberley district.

W. makhani Hoser, 2013 occurs around Mount Isa, in north-west Queensland. It has been referred to both *W. storri* (Mertens, 1966), *W. ocreatus* (Storr, 1980) and *W. makhani* Hoser, 2013 by other authors.

W. kimaniadilbodeni sp. nov. (this paper) is known from the general vicinity of Turkey Creek and the Bungle Bungles in Western Australia (upper Ord River drainage) north to at least Halls Creek in the east Kimberley of Western Australia.

W. microocellata sp. nov. (this paper) is known from the general vicinity of Theda Station in the north-east Kimberley ranges and includes populations north and west of there to the coast.

W. tyeseeipperae sp. nov. (this paper) occurs in the general region of the Gregory National Park in north-west Northern Territory and immediately adjacent rocky hills in the area east of the West Baines River.

W. scotteipperi sp. nov. (this paper), occurs in the rocky hilly area south of the Gulf of Carpentaria in the Northern Territory. The specific status of specimens from between this area and Mount Isa, on the Queensland side of the border and found also near the Gulf of Carpentaria is not known, but are thought to be conspecific.

W. kingorum (Storr, 1980) as recognized to date is found in two disjunct populations, one in far north-west Northern Territory, near the West Australian border in the general vicinity of Timber Creek and the other population is found in the Ord River drainage, mainly in the hills west of the river, in far north-west Australia, herein regarded as a separate species-level taxon and formally named in a separate paper published at the same time as this one in the same journal.

W. acanthurus (Boulenger, 1885) is found in most parts of the Northern Territory, excluding the far top end, where it is replaced by *W. insulanicus* (Mertens, 1958) and *W. baritji* (king and Horner, 1987), the latter of the pair herein regarded as at best a subspecies of the former. *W. acanthurus* also occurs in nearby parts of north-west Queensland as well as most of the top half of Western Australia, with the notable exception of most of the Pilbara region, where it is replaced with the species *W. dannybrowni sp. nov.*.

W. brachyurus (Sternfeld, 1919) based on the phylogeny of Fitch *et al.* (2006) is herein regarded as a synonym of *W. acanthurus* at the species level.

W. dannybrowni sp. nov. occurs in the hillier parts of the Pilbara in Western Australia and immediately adjacent areas. The exact range zones boundary between *W. dannybrowni sp. nov*. and *W. acanthurus* are not known.

The entirety of the subgenus *Worrellisaurus* is therefore *W. acanthurus*, *W. dannybrowni sp. nov*., *W. insulanicus* which includes as a species-level junior synonym *W. baritji*, *W. kimaniadilbodeni sp. nov*. (this paper), *W. kingorum*, *W. makhani*, *W. microocellata sp. nov*. (this paper), *W. ocreatus*, *W. primordius* including the subspecies *W. primordius dalyi*, *W. scotteipperi sp. nov.* (this paper), *W. storri* and *W. tyeseeipperae sp. nov.* (this paper).

Hoser (2013) has in effect been corrected herein to remove from the species list both *W. baritji*, now a synonym of *W. insulanicus* and *W. brachyurus*, now a synomym of *W. acanthurus*. The other newly described forms (5 in this paper and *W. makhani*) have been added to the species in the subgenus.

The only other taxon formally named in this paper is from a subgenus of *Worrellisaurus*, namely *Arborhabitatiosaurus* Hoser, 2013 and it has until now been treated as a population of *W. gilleni* (Lucas and Frost, 1895).

W. gilleni as recognized to date occurs throughout the interior of Australia in an area extending from just inside north-west Queensland, across the southern half of the Northern Territory and northern two thirds of South Australia, not including New South Wales or Victoria, but extending into most of the interior of Western Australia. In the far west, near the west Australian coast in the Pilbara it is replaced with the associated species-level taxon, *W. bushi* (Aplin, Fitch and King, 2006) and south of there with another closely associated taxon, *W. caudolineatus* (Boulenger, 1885).

The southern part of the range of what has until now been treated as *W. gilleni* in the area of South Australia north and west of the Flinders Ranges is of the taxon newly described herein namely *W. jenandersonae sp. nov.*.

The four species, *W. gilleni*, *W. bushi*, *W. caudolineatus* and *W. jenandersonae sp. nov.* make up the entirety of the subgenus *Arborhabitatiosaurus* Hoser, 2013.

The subgenus *Parvavaranus* Hoser, 2013 is the only other subgenus within the genus *Worrellisaurus* Wells and Wellington, 1984 and its component species are almost unchanged from

Hoser (2013), save for the addition of a single species formally named in 2014, namely "*Varanus sparnus* Doughty, Kealley, Fitch and Donnellan, 2014".

In other words it's status is as follows:

Type species of *Parvavaranus* is "*Varanus brevicauda* Boulenger, 1898".

Content of *Parvavaranus* is *Worrellisaurus brevicauda* (Boulenger, 1898), *W. eremius* (Lucas and

Frost, 1895) and *W. sparnus* Doughty, Kealley, Fitch and Donnellan, 2014.

In passing, I note that the phylogeny of Fitch *et al.* (2006) also provides a basis to divide the subgenus *Worrellisaurus* into two subgenus groups, one being the so-called "*acanthurus* group" and the other the so-called "*primordius* group".

However the more recent evidence of Pyron *et al.* (2013) while supporting the other genus and subgenus level splits of Hoser (2013) is ambiguous in terms of further division of *Worrellisaurus* beyond that of Hoser (2013), especially with reference to the "*acanthurus* group" and the "*primordius* group" and so no move with regards to splitting these groups is done in this paper.

At the same time these papers are published, another formally names a new species in the *Odatria glauerti* (Mertens, 1957) species complex, again supported by the published phylogeny of Fitch *et al.* (2006), this being in addition to *O. hoserae* Hoser, 2013. Yet another paper names a new taxon in the *Odatria* (*Kimberleyvaranus*) *glebopalma* (Mitchell, 1955) species complex. these are in addition to the previously mentioned paper dealing with the splitting of putative *W. kingorum* (Storr, 1980).

WORRELLISAURUS* (*WORRELLISAURUS*) *KIMANIADILBODENI SP. NOV.

Holotype: A preserved specimen in the Northern Territory Museum, Darwin, Northern Territory, Australia, specimen number: R24074, collected from 5 KM west of the park Boundary, Bungle Bungles National Park, Western Australia, Australia, Latitude -17.37 S., Longitude 128.18 E.

The Northern Territory Museum, Darwin, Northern Territory, Australia is a government-owned facility that allows access to its collections.

Paratype: A preserved specimen in the Western Australian Museum, Perth, Western Australia, Australia, specimen number: R152716, collected at Purnululu (Bungle Bungles) National Park, Western Australia, Australia, Latitude -17.39 S., Longitude 128.26 E.

Diagnosis: In order to separate this and all other species formally named for the first time in this paper within the subgenus *Worrellisaurus* Wells and Wellington, 1984, as defined for the first time by Hoser (2013), the various species groups within *Worrellisaurus* need to be separated from one another first.

The so-called "*primordius*" group of species, defined herein includes, *W. kimaniadilbodeni sp. nov.* (this paper), *W. makhani* Hoser, 2013, *W. microocellata sp. nov.* (this paper), *W. ocreatus* (Storr, 1980), *W. primordius* (Mertens, 1942) (including the subspecies *W. primordius dalyi* Hoser, 2015) as defined in Hoser (2015g), *W. tyeseeipperae sp. nov.* (this paper), *W. scotteipperi sp. nov.* (this paper) and *W. storri* (Mertens, 1966). These species are readily separated from the "*acanthurus*" group of species by the following characters: A small monitor (up to 35 cm long) (versus 60-70 cm in the "*acanthurus*" group) with strongly spinose tail, the body lacks a distinct or indistinct pattern of medium-sized ocelli (versus present in the "*acanthurus*" group), lacks obvious narrow yellow or yellowish rings on the upper surface of the anterior tail, less than 91 mid-body rows (versus 70-115 in the "*acanthurus*" group), less than 58 transverse ventrals and the neck is never boldly striped (which it is in the "*acanthurus*" group).

The taxon *W. kingorum* (Storr, 1980), including the similar species from Western Australia from the hills adjacent to the Ord River drainage (also formally described as a new species by myself at the same time this paper has been published), until now treated as *W. kingorum* is phylogenetically grouped with the so-called "*primordius*" group of species. It/they are readily separated from the other species in the group by the lack of a series of enlarged keeled scales on either side of the vent. They are also separated from the "*acanthurus*" group on the same basis.

W. primordius (Mertens, 1942) (including the subspecies *W. primordius dalyi* Hoser, 2015) as defined in Hoser (2015g), are separated from all the other species in the group by the presence of fewer than 66 mid-body rows, versus more than 70 in all other species, which also appear to form a well-defined clade. Exceptional to this is the species *W. scotteipperi sp. nov.*, which has 67-69 mid-body rows, separating this species from all other relevant taxa.

The species *W. storri* is herein restricted to an area east of Croydon in Queensland (Latitude -18.21 S., Longitude 142.24 E.) being found in drier rocky parts of north-east Queensland.

Specimens from around the Mount Isa district in Western Queensland are *W. makhani*.

All others in the group, until now treated as *W. storri* by authors including Cogger (2014) and Wilson and Swan (2017) (as defined by them), except for *W. storri* are readily separated from *W. storri* by the enlarged scales under distal part of hindleg (not present in *W. storri*) as seen in the comparative image in Brown (2012), page 193 (second from top) and (in adults at least) the readily noticeably longer tail (1.7-1.9 times body length, versus 1.45-1.55 times), average lighter build in adults and slightly longer limbs.

Worrellisaurus kimaniadilbodeni sp. nov. (this paper), *W. makhani*, *W. microocellata sp. nov.* (this paper), *W. ocreatus* and *W. tyeseeipperae sp. nov.* (this paper) are readily separated from *W. storri* and *W. scotteipperi sp. nov.* (this paper) by colouration. *W. storri* and *W. scotteipperi sp. nov.* (this paper) are characterized by a distinctive dark temporal streak running through the eye, being wide or 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 the other species, the same temporal streak is indistinct beyond the eye and it is not bounded by a white streak underneath, as it is in *W. storri* and *W. scotteipperi sp. nov.*. *W. scotteipperi sp. nov.* is separated from *W. storri* by the presence of the thick well-defined dark streak running from the nostril to the eye, versus thin, sometimes broken, or triangular in *W. storri.*

W. storri are further readily separated from *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. microocellata sp. nov.*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by the presence of distinctive dark flecks or spots below the temporal streak at the lower rear of the head, which tend to be absent, very small or indistinct on the other species.

W. microocellata sp. nov. is separated from *W. kimaniadilbodeni sp. nov.* *W. makhani*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by a lack of white pigment on the lower jaw, throat and lower neck, with widely scattered tiny dark spots only. This trait it shares in common with *W. ocreatus* although the widely scattered spots are slightly more numerous in *W. ocreatus.* *W. microocellata sp. nov.*, has an absence of darker spots on the lower jaw, which then abruptly become common on the throat and lower jaw. *W. makhani* and *W. kimaniadilbodeni sp. nov.* have an even and well defined pattern of dark spots on the lower jaw, throat and lower neck.

W. tyeseeipperae sp. nov. has flecks of dark pigment configured to form a series of broken cross-bands running across the lower throat region. *W. scotteipperi sp. nov.* has minimal dark spotting on the lower jaw and upper throat, while the throat and neck effectively lack any dark spots. Furthermore in *W. scotteipperi sp. nov.* the lower flanks of the neck are white and effectively lack any dark spotting as seen in all of *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. microocellata sp. nov.*, *W. ocreatus* and *W. tyeseeipperae sp. nov.*.

W. microocellata sp. nov. is separated from *W. ocreatus* by the presence of numerous regular patterned dark flecks on each side of the head and a top of the head darker in colour than the body, versus irregular scattered dark flecks on a light background on each side of the head and a head of same colour as the upper body.

W. microocellata sp. nov. is further separated from all of *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by a unique

dorsal pattern consisting of a strong reddish tinge running along the verterbral line and nearby parts of the upper back on the body, becoming greyish-black on the upper flanks, with a dorsal pattern consisting of tiny white squarish blotches on the dorsal surface of the forebody, tending to become tiny ocelli on the posterior part of the upper body, all against a mainly blackish-grey background.

Both *W. microocellata sp. nov*. and *W. kimaniadilbodeni sp. nov*. are separated from all of *W. makhani*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by the presence of a well defined dark curved line, bounded by white along the upper and lower side situated on the side of the supraciliary ridge on each side of the head.

W. microocellata sp. nov. is separated from all of *W. kimaniadilbodeni sp. nov*., *W. makhani*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by the presence of prominent raised white spots on scales on the mid flanks of the base of the tail. *W. kimaniadilbodeni sp. nov*. has indistinct cream spots on the same raised scales. *W. ocreatus* has scattered black dots on some raised scales on the mid-flanks of the base of the tail.

Unlike the species *W. microocellata sp. nov*., *W. kimaniadilbodeni sp. nov*. and *W. ocreatus* the three species *W. makhani*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* are characterized by a lack of any consistent configuration of raised coloured scales on the flanks of the upper tail. In all three there is at best widely scattered and irregular dark tipped scales. For these three species the flanks of the anterior tail are best described as grading gradually from the dark upper colour to the whitish venter colour, with all scales being of similar colour consistency, as opposed to dark or light coloured centres, contrasting with the nearby scale colour.

W. kimaniadilbodeni sp. nov. and *W. scotteipperi sp. nov.* are separated from all of *W. microocellata sp. nov*., *W. ocreatus, W. makhani*, and *W. tyeseeipperae sp. nov.* by the fact that the upper labials above the eye are configured in alternating dark and light, being dark brown and yellowish white, the rectangular blotches giving the upper jaw a barred appearance.

Under the eye, the upper labials of *W. ocreatus*, *W. makhani* and *W. microocellata sp. nov.* are either one colour, one colour evenly peppered with numerous dark flecks, or one colour with irregular dark flecks.

W. tyeseeipperae sp. nov. is separated from all of *W. kimaniadilbodeni sp. nov*., *W. scotteipperi sp. nov., W. microocellata sp. nov*., *W. ocreatus,* and *W. makhani* by the unique presence of irregular large blotches on a whitish background on the upper labials, not forming any barred configuration as well as a pattern of dense dark speckling on the neck, becoming more dense on the sides and giving a reticulated appearance, the darker flecks extending onto the lower neck.

W. tyeseeipperae sp. nov. is further separated from all of *W. kimaniadilbodeni sp. nov*., *W. scotteipperi sp. nov., W. microocellata sp. nov*., *W. ocreatus,* and *W. makhani* by the fact that the front of the tail is characterised by the fact that from about scale row 11 past the pelvic girdle (back legs), the raised spines on the upper surface are all tipped with well-defined black spines, running to the end of the tail.

While all Western Australian species *W. tyeseeipperae sp. nov.*, *W. kimaniadilbodeni sp. nov*., *W. microocellata sp. nov*., and *W. ocreatus,* may have visible and prominent longitudinal stripes running along the rear end of the dorsal surface of the tail, this is not the case for any of the East Australian species, namely *W. makhani*, *W. scotteipperi sp. nov*., or for that matter *W. storri.*

The longitudinal striping at the lower end of the tail in *W. tyeseeipperae sp. nov.* is prominent, versus prominent, but with lighter, but still well-defined dark and light stripes in *W. ocreatus* and these are indistinct in *W. kimaniadilbodeni sp. nov*. and *W. microocellata sp. nov*..

W. tyeseeipperae sp. nov. is different from all of *W. kimaniadilbodeni sp. nov*., *W. scotteipperi sp. nov., W. microocellata sp. nov*., *W. ocreatus,* and *W. makhani* in that all but very aged specimens have the upper surface of the head including the snout characterised by distinctive dark markings on a very light background, versus a dorsal surface of the head being generally unmarked, or occasionally peppered in all the other species, the peppered condition being most commonly seen in *W. makhani.*

W. scotteipperi sp. nov. is separated from all of *W. kimaniadilbodeni sp. nov*., *W. makhani*, *W. microocellata sp. nov*., *W. ocreatus*, and *W. tyeseeipperae sp. nov.* by a lack of any defined longitudinal striping at the latter part of the tail, save for a broken dorsolateral line, with the breaks being sufficiently wide to give the end of the tail an appearance of having cross-bands similar to those seen in the so-called "*acanthurus*" group of species.

Because *W. scotteipperi sp. nov.* has no such rings on the anterior part of the tail, it cannot possibly be confused with any of the so-called "*acanthurus*" group of species.

W. microocellata sp. nov. is readily separated from *W. kimaniadilbodeni sp. nov*., *W. makhani*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov*. by tail length in adults. In *W. microocellata sp. nov*. it is 1.8-1.9 times the body length, versus 1.7-1.8 times body length in the other five species.

In terms of the other three species found in the Kimberley and nearby parts of the Northern Territory, this is a significant difference and appears to be due to a character displacement event that may have occurred in the areas inhabited by the other three. Those species are all apparently sympatric with *W. kingorum* (in the NT) and a newly described similar species from the Ord River drainage in Western Australia, that had until now been treated as a western population of *W. kingorum*. *W. kingorum* occupies similar and same habitat as the other species and it's most significant difference is a more gracile build, including a tail that is more than 200% the length of the body.

Where both *W. kingorum* and *W. kimaniadilbodeni sp. nov*., *W. ocreatus* or *W. tyeseeipperae sp. nov*.. occur in sympatry, *W. kingorum* is most common on large hills with large amounts of rock sheets across the ground, boulders and the like, whereas the other three are most common on rocky habitats between the hills if present, lower scree slopes and the like.

W. microocellata sp. nov. also appears to have a more elongate body and head than *W. kimaniadilbodeni sp. nov*., *W. ocreatus* and *W. tyeseeipperae sp. nov*..

The holotype of *W. ocreatus* and all live specimens inspected by this author from the type locality are of the same form and colour. They are reddish across the entire dorsal surface, overlain with fine black peppering, in a configuration that occasionally gives a slightly reticulated pattern on the upper body surface. This is quite unlike any other species of *Worrellisaurus*. Closest to this condition among the relevant species is *W. kimaniadilbodeni sp. nov*. which is orangeish yellow on top of the body with similar flecks to *W. ocreatus* with significant dark brown scales as flecks in a banded configuration on the venter, as opposed to limited dark scales on the venter of *W. ocreatus.*

W. tyeseeipperae sp. nov. is unusual among *W. kimaniadilbodeni sp. nov*., *W. makhani*, *W. microocellata sp. nov*., *W. ocreatus* and *W. scotteipperi sp. nov*. in that on the upper surface of the body, specimens lacks obvious spots, flecks, peppering or markings on all but the upper back, this being the normal condition for even younger specimens.

W. makhani and *W. scotteipperi sp. nov*. are both characterized by a dorsal colour pattern consisting of darker brown pigment overlain with lighter brown specking in clusters or longitudinal lines, tending to form small dark edged ocelli on the back, with lighter centres. In *W. makhani* these ocelli merge on the lower back to form semi-distinct vertebral lines, which is not the case in *W. scotteipperi sp. nov*..

Specimens attributed to "*Varanus storri ocreatus*" have been collected from Christmas Creek Station, Western Australia (south-east of Fitzroy Crossing in the south-east Kimberley), as well as the Mornington Wildlife Sanctuary (southern central Kimberley) and 50 km east of Derby in the south-west Kimberley. These specimens have not been examined by myself and so their specific status is not known. Specimens attributed to "*Varanus storri ocreatus*" from north and west of the Drysdale River in Western Australia are referrable to *W. microocellata sp. nov*..

Photos of *Worrellisaurus kimaniadilbodeni sp. nov.* in life from Halls Creek, Western Australia, can be found on the photo sales site of https://www.gettyimages.com.au.

Distribution: *Worrellisaurus kimaniadilbodeni sp. nov.* is known only from a few scattered locations in the south-eastern part of the Kimberley District in Western Australia in an area, generally running from the Bungle Bungles, near Turkey Creek (AKA Warmun), Western Australia, south to about 26 km south of Halls Creek, Western Australia.

Etymology: Named in honour of Kimani Adil Boden, a lawyer based in Melbourne, Victoria, Australia for his work in taking on important human rights cases, such as when innocent, weak vulnerable new Australians are illegally bashed by violent thugs employed by the Victoria Police and/or wrongly charged and jailed for fictitious criminal offences often committed by the police (Farrant 2012, Gregory and Chessell 2012, Iaria and Best 2009, Lillebuen 2010, Szego 2014).

WORRELLISAURUS* (*WORRELLISAURUS*) *MICROOCELLATA SP. NOV.

Holotype: A preserved specimen in the Western Australian Museum, Perth, Western Australia, Australia, specimen number: R57244, collected from the Old Theda Station Homestead at the junction of Palmoondoora Creek and Morgan River, Western Australia, Australia, Latitude -14.82 S., Longitude 126.67 E.

The Western Australian Museum, Perth, Western Australia, Australia is a government-owned facility that allows access to its collections.

Diagnosis: In order to separate this and all other species formally named for the first time in this paper within the subgenus *Worrellisaurus* Wells and Wellington, 1984, as defined for the first time by Hoser (2013), the various species groups within *Worrellisaurus* need to be separated from one another first.

The so-called "*primordius*" group of species, defined herein includes, *W. kimaniadilbodeni sp. nov.* (this paper), *W. makhani* Hoser, 2013, *W. microocellata sp. nov.* (this paper), *W. ocreatus* (Storr, 1980), *W. primordius* (Mertens, 1942) (including the subspecies *W. primordius dalyi* Hoser, 2015) as defined in Hoser (2015g), *W. tyeseeipperae sp. nov.* (this paper), *W. scotteipperi sp. nov.* (this paper) and *W. storri* (Mertens, 1966). These species are readily separated from the "*acanthurus*" group of species by the following characters: A small monitor (up to 35 cm long) (versus 60-70 cm in the "*acanthurus*" group) with strongly spinose tail, the body lacks a distinct or indistinct pattern of medium-sized ocelli (versus present in the "*acanthurus*" group), lacks obvious narrow yellow or yellowish rings on the upper surface of the anterior tail, less than 91 mid-body rows (versus 70-115 in the "*acanthurus*" group), less than 58 transverse ventrals and the neck is never boldly striped (which it is in the "*acanthurus*" group).

The taxon *W. kingorum* (Storr, 1980), including the similar species from Western Australia from the hills adjacent to the Ord River drainage (also formally described as a new species by myself at the same time this paper is/was published), until now treated as *W. kingorum* is phylogenetically grouped with the so-called "*primordius*" group of species. It/they are readily separated from the other species in the group by the lack of a series of enlarged keeled scales on either side of the vent. They are also separated from the "*acanthurus*" group on the same basis.

W. primordius (Mertens, 1942) (including the subspecies *W. primordius dalyi* Hoser, 2015) as defined in Hoser (2015g), are separated from all the other species in the group by the presence of fewer than 66 mid-body rows, versus more than 70 in all other species, which also appear to form a well-defined clade. Exceptional to this is the species *W. scotteipperi sp. nov.*, which has 67-69 mid-body rows, separating this species from all other relevant taxa.

The species *W. storri* is herein restricted to an area east of Croydon in Queensland (Latitude -18.21 S., Longitude 142.24 E.) being found in drier rocky parts of north-east Queensland.

Specimens from around the Mount Isa district in Western Queensland are *W. makhani*.

All others in the group, until now treated as *W. storri* by authors including Cogger (2014) and Wilson and Swan (2017) (as defined by them), except for *W. storri* are readily separated from *W. storri* by the enlarged scales under distal part of hindleg (not present in *W. storri*) as seen in the comparative image in Brown (2012), page 193 (second from top) and (in adults at least) the readily noticeably longer tail (1.7-1.9 times body length, versus 1.45-1.55 times), average lighter build in adults and slightly longer limbs.

Worrellisaurus kimaniadilbodeni sp. nov. (this paper), *W. makhani*, *W. microocellata sp. nov.* (this paper), *W. ocreatus* and *W. tyeseeipperae sp. nov.* (this paper) are readily separated from *W. storri* and *W. scotteipperi sp. nov.* (this paper) by colouration. *W. storri* and *W. scotteipperi sp. nov.* (this paper) are characterized by a distinctive dark temporal streak running through the eye, being wide or 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 the other species, the same temporal streak is indistinct beyond the eye and it is not bounded by a white streak underneath, as it is in *W. storri* and *W. scotteipperi sp. nov.*. *W. scotteipperi sp. nov.* is separated from *W. storri* by the presence of the thick well-defined dark streak running from the nostril to the eye, versus thin, sometimes broken, or triangular in *W. storri.*

W. storri are further readily separated from *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. microocellata sp. nov.*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by the presence of distinctive dark flecks or spots below the temporal streak at the lower rear of the head, which tend to be absent, very small or indistinct on the other species.

W. microocellata sp. nov. is separated from *W. kimaniadilbodeni sp. nov.* *W. makhani*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by a lack of white pigment on the lower jaw, throat and lower neck, with widely scattered tiny dark spots only. This trait it shares in common with *W. ocreatus* although the widely scattered spots are slightly more numerous in *W. ocreatus.* *W. microocellata sp. nov.*, has an absence of darker spots on the lower jaw, which then abruptly become common on the throat and lower jaw. *W. makhani* and *W. kimaniadilbodeni sp. nov.* have an even and well defined pattern of dark spots on the lower jaw, throat and lower neck.

W. tyeseeipperae sp. nov. has flecks of dark pigment configured to form a series of broken cross-bands running across the lower throat region. *W. scotteipperi sp. nov.* has minimal dark spotting on the lower jaw and upper throat, while the throat and neck effectively lack any dark spots. Furthermore in *W. scotteipperi sp. nov.* the lower flanks of the neck are white and effectively lack any dark spotting as seen in all of *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. microocellata sp. nov.*, *W. ocreatus* and *W. tyeseeipperae sp. nov.*.

W. microocellata sp. nov. is separated from *W. ocreatus* by the presence of numerous regular patterned dark flecks on each side of the head and a top of the head darker in colour than the body, versus irregular scattered dark flecks on a light background on each side of the head and a head of same colour as the upper body.

W. microocellata sp. nov. is further separated from all of *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by a unique dorsal pattern consisting of a strong reddish tinge running along the verterbral line and nearby parts of the upper back on the body, becoming greyish-black on the upper flanks, with a dorsal pattern consisting of tiny white squarish blotches on the dorsal surface of the forebody, tending to become tiny ocelli on the posterior part of the upper body, all against a mainly blackish-grey background.

Both *W. microocellata sp. nov.* and *W. kimaniadilbodeni sp. nov.* are separated from all of *W. makhani*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by the presence of a well defined dark curved line, bounded by white along the upper and lower side situated on the side of the supraciliary ridge on each side of the head.

W. microocellata sp. nov. is separated from all of *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by the

presence of prominent raised white spots on scales on the mid flanks of the base of the tail. *W. kimaniadilbodeni sp. nov*. has indistinct cream spots on the same raised scales. *W. ocreatus* has scattered black dots on some raised scales on the mid-flanks of the base of the tail.

Unlike the species *W. microocellata sp. nov*., *W. kimaniadilbodeni sp. nov*. and *W. ocreatus* the three species *W. makhani*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* are characterized by a lack of any consistent configuration of raised coloured scales on the flanks of the upper tail. In all three there is at best widely scattered and irregular dark tipped scales. For these three species the flanks of the anterior tail are best described as grading gradually from the dark upper colour to the whitish venter colour, with all scales being of similar colour consistency, as opposed to dark or light coloured centres, contrasting with the nearby scale colour.

W. kimaniadilbodeni sp. nov. and *W. scotteipperi sp. nov.* are separated from all of *W. microocellata sp. nov*., *W. ocreatus, W. makhani*, and *W. tyeseeipperae sp. nov.* by the fact that the upper labials above the eye are configured in alternating dark and light, being dark brown and yellowish white, the rectangular blotches giving the upper jaw a barred appearance.

Under the eye, the upper labials of *W. ocreatus*, *W. makhani* and *W. microocellata sp. nov.* are either one colour, one colour evenly peppered with numerous dark flecks, or one colour with irregular dark flecks.

W. tyeseeipperae sp. nov. is separated from all of *W. kimaniadilbodeni sp. nov*., *W. scotteipperi sp. nov., W. microocellata sp. nov*., *W. ocreatus,* and *W. makhani* by the unique presence of irregular large blotches on a whitish background on the upper labials, not forming any barred configuration as well as a pattern of dense dark speckling on the neck, becoming more dense on the sides and giving a reticulated appearance, the darker flecks extending onto the lower neck.

W. tyeseeipperae sp. nov. is further separated from all of *W. kimaniadilbodeni sp. nov*., *W. scotteipperi sp. nov., W. microocellata sp. nov*., *W. ocreatus,* and *W. makhani* by the fact that the front of the tail is characterised by the fact that from about row 11 past the pelvic girdle (back legs), the raised spines on the upper surface are all tipped with well-defined black spines, running to the end of the tail.

While all Western Australian species *W. tyeseeipperae sp. nov*., *W. kimaniadilbodeni sp. nov*., *W. microocellata sp. nov*., and *W. ocreatus,* may have visible and prominent longitudinal stripes running along the rear end of the dorsal surface of the tail, this is not the case for any of the East Australian species, namely *W. makhani*, *W. scotteipperi sp. nov*., or for that matter *W. storri.*

The longitudinal striping at the lower end of the tail in *W. tyeseeipperae sp. nov.* is prominent, versus prominent, but with lighter, but still well-defined dark and light stripes in *W. ocreatus* and these are indistinct in *W. kimaniadilbodeni sp. nov*. and *W. microocellata sp. nov*..

W. tyeseeipperae sp. nov. is different from all of *W. kimaniadilbodeni sp. nov*., *W. scotteipperi sp. nov., W. microocellata sp. nov*., *W. ocreatus,* and *W. makhani* in that all but very aged specimens have the upper surface of the head including the snout characterised by distinctive dark markings on a very light background, versus a dorsal surface of the head being generally unmarked, or occasionally peppered in all the other species, the peppered condition being most commonly seen in *W. makhani.*

W. scotteipperi sp. nov. is separated from all of *W. kimaniadilbodeni sp. nov*., *W. makhani*, *W. microocellata sp. nov*., *W. ocreatus*, and *W. tyeseeipperae sp. nov.* by a lack of any defined longitudinal striping at the latter part of the tail, save for a broken dorsolateral line, with the breaks being sufficiently wide to give the end of the tail an appearance of having cross-bands similar to those seen in the so-called "*acanthurus*" group of species.

Because *W. scotteipperi sp. nov.* has no such rings on the anterior part of the tail, it cannot possibly be confused with any of the so-called "*acanthurus*" group of species.

W. microocellata sp. nov. is readily separated from *W. kimaniadilbodeni sp. nov*., *W. makhani*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov*. by tail length in adults. In *W. microocellata sp. nov*. it is 1.8-1.9 times the body length, versus 1.7-1.8 times body length in the other five species.

In terms of the other three species found in the Kimberley and nearby parts of the Northern Territory, this is a significant difference and appears to be due to a character displacement event that may have occurred in the areas inhabited by the other three. Those species are all apparently sympatric with *W. kingorum* (in the NT) and a newly described similar species from the Ord River drainage in Western Australia, that had until now been treated as a western population of *W. kingorum*. *W. kingorum* occupies similar and same habitat as the other species and it's most significant difference is a more gracile build, including a tail that is more than 200% the length of the body.

Where both *W. kingorum* and *W. kimaniadilbodeni sp. nov*., *W. ocreatus* or *W. tyeseeipperae sp. nov*.. occur in sympatry, *W. kingorum* is most common on large hills with large amounts of rock sheets across the ground, boulders and the like, whereas the other three are most common on rocky habitats between the hills if present, lower scree slopes and the like.

W. microocellata sp. nov. also appears to have a more elongate body and head than *W. kimaniadilbodeni sp. nov*., *W. ocreatus* and *W. tyeseeipperae sp. nov*.. however this is not quantified herein, due to insufficient sample sizes.

The holotype of *W. ocreatus* and all live specimens inspected by this author from the type locality are of the same form and colour. They are reddish across the entire dorsal surface, overlain with fine black peppering, in a configuration that occasionally gives a slightly reticulated pattern on the upper body surface. This is quite unlike any other species of *Worrellisaurus*. Closest to this condition among the relevant species is *W. kimaniadilbodeni sp. nov*. which is orangeish yellow on top of the body with similar flecks to *W. ocreatus* with significant dark brown scales as flecks in a banded configuration on the venter, as opposed to limited dark scales on the venter of *W. ocreatus.*

W. tyeseeipperae sp. nov. is unusual among *W. kimaniadilbodeni sp. nov*., *W. makhani*, *W. microocellata sp. nov*., *W. ocreatus* and *W. scotteipperi sp. nov*. in that on the upper surface of the body, specimens lacks obvious spots, flecks, peppering or markings on all but the upper back, this being the normal condition for even younger specimens.

W. makhani and *W. scotteipperi sp. nov.* are both characterized by a dorsal colour pattern consisting of darker brown pigment overlain with lighter brown specking in clusters or longitudinal lines, tending to form small dark edged ocelli on the back, with lighter centres. In *W. makhani* these ocelli merge on the lower back to form semi-distinct vertebral lines, which is not the case in *W. scotteipperi sp. nov*..

Specimens attributed to "*Varanus storri ocreatus*" have been collected from Christmas Creek Station, Western Australia (south-east of Fitzroy Crossing in the south-east Kimberley), as well as the Mornington Wildlife Sanctuary (southern central Kimberley) and 50 km east of Derby in the south-west Kimberley. These specimens have not been examined by myself and so their specific status is not known. Specimens attributed to "*Varanus storri ocreatus*" from north and west of the Drysdale River in Western Australia are referrable to *W. microocellata sp. nov*..

Three photos of this species, *W. microocellata sp. nov.* are on page 873 of Brown (2014) all labelled as "*Varanus storri ocreatus*".

Distribution: The type locality of the Old Theda Station Homestead at the junction of Palmoondoora Creek and Morgan River, Kimberley district, Western Australia, Australia, Latitude -14.82 S., Longitude 126.67 E, marks the approximate known region of the south-eastern limit of distribution of this species, *W. microocellata sp. nov*..

It is also found in areas to the north and west of here to the coasts where suitable habitat exists. It occurs an unknown distance from the vicinity of the Old Theda Station Homestead in other directions to the south and south-west.

Etymology: The name "*microocellata*" refers to the very small (as in "micro") ocelli on the lower back characteristic of this species.

WORRELLISAURUS* (*WORRELLISAURUS*) *TYESEEIPPERAE SP. NOV.

Holotype: A preserved specimen at the Museum and Art Gallery of the Northern Territory Reptile Collection (AKA Northern Territory Museum) at Darwin, Northern Territory, Australia, specimen number: R13860, collected at the Bullita Area, Gregory National Park, Northern Territory, Australia, Latitude -16.12 S., Longitude 130.42 E.
The Northern Territory Museum, Australia is a government-owned facility that allows access to its collections.

Paratype: A preserved specimen in the Western Australian Museum, Perth, Western Australia, Australia, specimen number: R60043, collected at Gordon Creek, 48 km south of Victoria River Downs, 1 km from a creek from within a loose "ant mound", Latitude -16.83 S., Longitude 131.02 E.

Diagnosis: In order to separate this and all other species formally named for the first time in this paper within the subgenus *Worrellisaurus* Wells and Wellington, 1984, as defined for the first time by Hoser (2013), the various species groups within *Worrellisaurus* need to be separated from one another first.

The so-called "*primordius*" group of species, defined herein includes, *W. kimaniadilbodeni sp. nov.* (this paper), *W. makhani* Hoser, 2013, *W. microocellata sp. nov.* (this paper), *W. ocreatus* (Storr, 1980), *W. primordius* (Mertens, 1942) (including the subspecies *W. primordius dalyi* Hoser, 2015) as defined in Hoser (2015g), *W. tyeseeipperae sp. nov.* (this paper), *W. scotteipperi sp. nov.* (this paper) and *W. storri* (Mertens, 1966). These species are readily separated from the "*acanthurus*" group of species by the following characters: A small monitor (up to 35 cm long) (versus 60-70 cm in the "*acanthurus*" group) with strongly spinose tail, the body lacks a distinct or indistinct pattern of medium-sized ocelli (versus present in the "*acanthurus*" group), lacks obvious narrow yellow or yellowish rings on the upper surface of the anterior tail, less than 91 mid-body rows (versus 70-115 in the "*acanthurus*" group), less than 58 transverse ventrals and the neck is never boldly striped (which it is in the "*acanthurus*" group).

The taxon *W. kingorum* (Storr, 1980), including the similar species from Western Australia from the hills adjacent to the Ord River drainage (also formally described as a new species by myself at the same time this paper is/was published), until now treated as *W. kingorum* is phylogenetically grouped with the so-called "*primordius*" group of species. It/they are readily separated from the other species in the group by the lack of a series of enlarged keeled scales on either side of the vent. They are also separated from the "*acanthurus*" group on the same basis.

W. primordius (Mertens, 1942) (including the subspecies *W. primordius dalyi* Hoser, 2015) as defined in Hoser (2015g), are separated from all the other species in the group by the presence of fewer than 66 mid-body rows, versus more than 70 in all other species, which also appear to form a well-defined clade. Exceptional to this is the species *W. scotteipperi sp. nov.*, which has 67-69 mid-body rows, separating this species from all other relevant taxa.

The species *W. storri* is herein restricted to an area east of Croydon in Queensland (Latitude -18.21 S., Longitude 142.24 E.) being found in drier rocky parts of north-east Queensland.

Specimens from around the Mount Isa district in Western Queensland are *W. makhani*.
All others in the group, until now treated as *W. storri* by authors including Cogger (2014) and Wilson and Swan (2017) (as defined by them), except for *W. storri* are readily separated from *W. storri* by the enlarged scales under distal part of hindleg (not present in *W. storri*) as seen in the comparative image in Brown (2012), page 193 (second from top) and (in adults at least) the readily noticeably longer tail (1.7-1.9 times body length, versus 1.45-1.55 times), average lighter build in adults and slightly longer limbs.

Worrellisaurus kimaniadilbodeni sp. nov. (this paper), *W. makhani*, *W. microocellata sp. nov.* (this paper), *W. ocreatus* and *W. tyeseeipperae sp. nov.* (this paper) are readily separated from *W. storri* and *W. scotteipperi sp. nov.* (this paper) by colouration. *W. storri* and *W. scotteipperi sp. nov.* (this paper) are characterized by a distinctive dark temporal streak running through the eye, being wide or 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 the other species, the same temporal streak is indistinct beyond the eye and it is not bounded by a white streak underneath, as it is in *W. storri* and *W. scotteipperi sp. nov.*. *W. scotteipperi sp. nov.* is separated from *W. storri* by the presence of the thick well-defined dark streak running from the nostril to the eye, versus thin, sometimes broken, or triangular in *W. storri.*

W. storri are further readily separated from *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. microocellata sp. nov.*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by the presence of distinctive dark flecks or spots below the temporal streak at the lower rear of the head, which tend to be absent, very small or indistinct on the other species.

W. microocellata sp. nov. is separated from *W. kimaniadilbodeni sp. nov.* *W. makhani*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by a lack of white pigment on the lower jaw, throat and lower neck, with widely scattered tiny dark spots only. This trait it shares in common with *W. ocreatus* although the widely scattered spots are slightly more numerous in *W. ocreatus.* *W. microocellata sp. nov.*, has an absence of darker spots on the lower jaw, which then abruptly become common on the throat and lower jaw. *W. makhani* and *W. kimaniadilbodeni sp. nov.* have an even and well defined pattern of dark spots on the lower jaw, throat and lower neck.

W. tyeseeipperae sp. nov. has flecks of dark pigment configured to form a series of broken cross-bands running across the lower throat region. *W. scotteipperi sp. nov.* has minimal dark spotting on the lower jaw and upper throat, while the throat and neck effectively lack any dark spots. Furthermore in *W. scotteipperi sp. nov.* the lower flanks of the neck are white and effectively lack any dark spotting as seen in all of *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. microocellata sp. nov.*, *W. ocreatus* and *W. tyeseeipperae sp. nov.*.

W. microocellata sp. nov. is separated from *W. ocreatus* by the presence of numerous regular patterned dark flecks on each side of the head and a top of the head darker in colour than the body, versus irregular scattered dark flecks on a light background on each side of the head and a head of same colour as the upper body.

W. microocellata sp. nov. is further separated from all of *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by a unique dorsal pattern consisting of a strong reddish tinge running along the verterbral line and nearby parts of the upper back on the body, becoming greyish-black on the upper flanks, with a dorsal pattern consisting of tiny white squarish blotches on the dorsal surface of the forebody, tending to become tiny ocelli on the posterior part of the upper body, all against a mainly blackish-grey background.

Both *W. microocellata sp. nov.* and *W. kimaniadilbodeni sp. nov.* are separated from all of *W. makhani*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by the presence of a well defined dark curved line, bounded by white along the upper and lower side situated on the side of the supraciliary ridge on each side of the head.

W. microocellata sp. nov. is separated from all of *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by the presence of prominent raised white spots on scales on the mid flanks of the base of the tail. *W. kimaniadilbodeni sp. nov.* has indistinct cream spots on the same raised scales. *W. ocreatus* has scattered black dots on some raised scales on the mid-flanks of the base of the tail.

Unlike the species *W. microocellata sp. nov.*, *W. kimaniadilbodeni sp. nov.* and *W. ocreatus* the three species *W. makhani*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* are characterized by a lack of any consistent configuration of raised coloured scales on the flanks of the upper tail. In all three there is at best widely scattered and irregular dark tipped scales. For these three species the flanks of the anterior tail are best described as

grading gradually from the dark upper colour to the whitish venter colour, with all scales being of similar colour consistency, as opposed to dark or light coloured centres, contrasting with the nearby scale colour.

W. kimaniadilbodeni sp. nov. and *W. scotteipperi sp. nov.* are separated from all of *W. microocellata sp. nov.*, *W. ocreatus, W. makhani*, and *W. tyeseeipperae sp. nov.* by the fact that the upper labials above the eye are configured in alternating dark and light, being dark brown and yellowish white, the rectangular blotches giving the upper jaw a barred appearance.

Under the eye, the upper labials of *W. ocreatus*, *W. makhani* and *W. microocellata sp. nov.* are either one colour, one colour evenly peppered with numerous dark flecks, or one colour with irregular dark flecks.

W. tyeseeipperae sp. nov. is separated from all of *W. kimaniadilbodeni sp. nov.*, *W. scotteipperi sp. nov., W. microocellata sp. nov.*, *W. ocreatus,* and *W. makhani* by the unique presence of irregular large blotches on a whitish background on the upper labials, not forming any barred configuration as well as a pattern of dense dark speckling on the neck, becoming more dense on the sides and giving a reticulated appearance, the darker flecks extending onto the lower neck.

W. tyeseeipperae sp. nov. is further separated from all of *W. kimaniadilbodeni sp. nov.*, *W. scotteipperi sp. nov., W. microocellata sp. nov.*, *W. ocreatus,* and *W. makhani* by the fact that the front of the tail is characterised by the fact that from about row 11 past the pelvic girdle (back legs), the raised spines on the upper surface are all tipped with well-defined black spines, running to the end of the tail.

While all Western Australian species *W. tyeseeipperae sp. nov.*, *W. kimaniadilbodeni sp. nov.*, *W. microocellata sp. nov.*, and *W. ocreatus,* may have visible and prominent longitudinal stripes running along the rear end of the dorsal surface of the tail, this is not the case for any of the East Australian species, namely *W. makhani*, *W. scotteipperi sp. nov.*, or for that matter *W. storri.*

The longitudinal striping at the lower end of the tail in *W. tyeseeipperae sp. nov.* is prominent, versus prominent, but with lighter, but still well-defined dark and light stripes in *W. ocreatus* and these are indistinct in *W. kimaniadilbodeni sp. nov*. and *W. microocellata sp. nov.*.

W. tyeseeipperae sp. nov. is different from all of *W. kimaniadilbodeni sp. nov.*, *W. scotteipperi sp. nov., W. microocellata sp. nov.*, *W. ocreatus,* and *W. makhani* in that all but very aged specimens have the upper surface of the head including the snout characterised by distinctive dark markings on a very light background, versus a dorsal surface of the head being generally unmarked, or occasionally peppered in all the other species, the peppered condition being most commonly seen in *W. makhani.*

W. scotteipperi sp. nov. is separated from all of *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. microocellata sp. nov.*, *W. ocreatus*, and *W. tyeseeipperae sp. nov.* by a lack of any defined longitudinal striping at the latter part of the tail, save for a broken dorsolateral line, with the breaks being sufficiently wide to give the end of the tail an appearance of having cross-bands similar to those seen in the so-called "*acanthurus*" group of species.

Because *W. scotteipperi sp. nov.* has no such rings on the anterior part of the tail, it cannot possibly be confused with any of the so-called "*acanthurus*" group of species.

W. microocellata sp. nov. is readily separated from *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov*. by tail length in adults. In *W. microocellata sp. nov*. it is 1.8-1.9 times the body length, versus 1.7-1.8 times body length in the other five species.

In terms of the other three species found in the Kimberley and nearby parts of the Northern Territory, this is a significant difference and appears to be due to a character displacement event that may have occurred in the areas inhabited by the other three. Those species are all apparently sympatric with *W. kingorum* (in the NT) and a newly described similar species from the Ord River drainage in Western Australia, that had until now been treated as a western population of *W. kingorum*. *W. kingorum* occupies similar and same habitat as the other species and it's most significant difference is a more gracile build, including a tail that is more than 200% the length of the body.

Where both *W. kingorum* and *W. kimaniadilbodeni sp. nov*., *W. ocreatus* or *W. tyeseeipperae sp. nov.*. occur in sympatry, *W. kingorum* is most common on large hills with large amounts of rock sheets across the ground, boulders and the like, whereas the other three are most common on rocky habitats between the hills if present, lower scree slopes and the like.

W. microocellata sp. nov. also appears to have a more elongate body and head than *W. kimaniadilbodeni sp. nov*., *W. ocreatus* and *W. tyeseeipperae sp. nov.*.

The holotype of *W. ocreatus* and all live specimens inspected by this author from the type locality are of the same form and colour. They are reddish across the entire dorsal surface, overlain with fine black peppering, in a configuration that occasionally gives a slightly reticulated pattern on the upper body surface. This is quite unlike any other species of *Worrellisaurus*. Closest to this condition among the relevant species is *W. kimaniadilbodeni sp. nov*. which is orangeish yellow on top of the body with similar flecks to *W. ocreatus* with significant dark brown scales as flecks in a banded configuration on the venter, as opposed to limited dark scales on the venter of *W. ocreatus.*

W. tyeseeipperae sp. nov. is unusual among *W. kimaniadilbodeni sp. nov*., *W. makhani*, *W. microocellata sp. nov*., *W. ocreatus* and *W. scotteipperi sp. nov*. in that on the upper surface of the body, specimens lacks obvious spots, flecks, peppering or markings on all but the upper back, this being the normal condition for even younger specimens.

W. makhani and *W. scotteipperi sp. nov*. are both characterized by a dorsal colour pattern consisting of darker brown pigment overlain with lighter brown specking in clusters or longitudinal lines, tending to form small dark edged ocelli on the back, with lighter centres. In *W. makhani* these ocelli merge on the lower back to form semi-distinct vertebral lines, which is not the case in *W. scotteipperi sp. nov.*.

Specimens attributed to "*Varanus storri ocreatus*" have been collected from Christmas Creek Station, Western Australia (south-east of Fitzroy Crossing in the south-east Kimberley), as well as the Mornington Wildlife Sanctuary (southern central Kimberley) and 50 km east of Derby in the south-west Kimberley. These specimens have not been examined by myself and so their specific status is not known. Specimens attributed to "*Varanus storri ocreatus*" from north and west of the Drysdale River in Western Australia are referrable to *W. microocellata sp. nov.*.

The specimen depicted as "Plate 11: A *Varanus storri ocreatus* from Gordon Creek, N.T. Photographed by G. Barron." in Storr (1980) is of the taxon *W. tyeseeipperae sp. nov.*.

Distribution: *Worrellisaurus tyeseeipperae sp. nov.* occurs in the general region of the Gregory National Park in north-west Northern Territory and immediately adjacent rocky hills in the area east of the West Baines River, also within the Northern Territory, Australia.

Etymology: Named in honour of Tyese Eipper, wife of Scott Eipper, both herpetologists of the south-eastern suburbs of Brisbane, Queensland, Australia, running the education business "Nature 4 You" wildlife demonstrations (www.wildlifedemonstrations.com) for services to herpetology spanning some decades.

WORRELLISAURUS* (*WORRELLISAURUS*) *SCOTTEIPPERI SP. NOV.

Holotype: A preserved specimen at the Museum and Art Gallery of the Northern Territory Reptile Collection (AKA Northern Territory Museum) at Darwin, Northern Territory, Australia, specimen number: R20415, collected at the McArthur River Station, Barney Hill, Northern Territory, Australia, Latitude -16.42 S., Longitude 136.10 E.

The Northern Territory Museum, Australia is a government-owned facility that allows access to its collections.

Paratypes: Four specimens collected from the same location as the holotype (McArthur River Station, Barney Hill, Northern Territory, Australia, Latitude -16.42 S., Longitude 136.10 E.), also

held at the Museum and Art Gallery of the Northern Territory Reptile Collection (AKA Northern Territory Museum) at Darwin, Northern Territory, Australia, specimen numbers: R17432, R17433, R20414, R20415.

Diagnosis: In order to separate this and all other species formally named for the first time in this paper within the subgenus *Worrellisaurus* Wells and Wellington, 1984, as defined for the first time by Hoser (2013), the various species groups within *Worrellisaurus* need to be separated from one another first.

The so-called "*primordius*" group of species, defined herein includes, *W. kimaniadilbodeni sp. nov.* (this paper), *W. makhani* Hoser, 2013, *W. microocellata sp. nov.* (this paper), *W. ocreatus* (Storr, 1980), *W. primordius* (Mertens, 1942) (including the subspecies *W. primordius dalyi* Hoser, 2015) as defined in Hoser (2015g), *W. tyeseeipperae sp. nov.* (this paper), *W. scotteipperi sp. nov.* (this paper) and *W. storri* (Mertens, 1966). These species are readily separated from the "*acanthurus*" group of species by the following characters: A small monitor (up to 35 cm long) (versus 60-70 cm in the "*acanthurus*" group) with strongly spinose tail, the body lacks a distinct or indistinct pattern of medium-sized ocelli (versus present in the "*acanthurus*" group), lacks obvious narrow yellow or yellowish rings on the upper surface of the anterior tail, less than 91 mid-body rows (versus 70-115 in the "*acanthurus*" group), less than 58 transverse ventrals and the neck is never boldly striped (which it is in the "*acanthurus*" group).

The taxon *W. kingorum* (Storr, 1980), including the similar species from Western Australia from the hills adjacent to the Ord River drainage (also formally described as a new species by myself at the same time this paper is/was published), until now treated as *W. kingorum* is phylogenetically grouped with the so-called "*primordius*" group of species. It/they are readily separated from the other species in the group by the lack of a series of enlarged keeled scales on either side of the vent. They are also separated from the "*acanthurus*" group on the same basis.

W. primordius (Mertens, 1942) (including the subspecies *W. primordius dalyi* Hoser, 2015) as defined in Hoser (2015g), are separated from all the other species in the group by the presence of fewer than 66 mid-body rows, versus more than 70 in all other species, which also appear to form a well-defined clade. Exceptional to this is the species *W. scotteipperi sp. nov.*, which has 67-69 mid-body rows, separating this species from all other relevant taxa.

The species *W. storri* is herein restricted to an area east of Croydon in Queensland (Latitude -18.21 S., Longitude 142.24 E.) being found in drier rocky parts of north-east Queensland.

Specimens from around the Mount Isa district in Western Queensland are *W. makhani*.

All others in the group, until now treated as *W. storri* by authors including Cogger (2014) and Wilson and Swan (2017) (as defined by them), except for *W. storri* are readily separated from *W. storri* by the enlarged scales under distal part of hindleg (not present in *W. storri*) as seen in the comparative image in Brown (2012), page 193 (second from top) and (in adults at least) the readily noticeably longer tail (1.7-1.9 times body length, versus 1.45-1.55 times), average lighter build in adults and slightly longer limbs.

Worrellisaurus kimaniadilbodeni sp. nov. (this paper), *W. makhani*, *W. microocellata sp. nov.* (this paper), *W. ocreatus* and *W. tyeseeipperae sp. nov.* (this paper) are readily separated from *W. storri* and *W. scotteipperi sp. nov.* (this paper) by colouration. *W. storri* and *W. scotteipperi sp. nov.* (this paper) are characterized by a distinctive dark temporal streak running through the eye, being wide or 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 the other species, the same temporal streak is indistinct beyond the eye and it is not bounded by a white streak underneath, as it is in *W. storri* and *W. scotteipperi sp. nov.*. *W. scotteipperi sp. nov.* is separated from *W. storri* by the presence of the thick well-defined dark streak running from the nostril to the eye, versus thin, sometimes broken, or triangular in *W. storri.*

W. storri are further readily separated from *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. microocellata sp. nov.*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by the presence of distinctive dark flecks or spots below the temporal streak at the lower rear of the head, which tend to be absent, very small or indistinct on the other species.

W. microocellata sp. nov. is separated from *W. kimaniadilbodeni sp. nov. W. makhani*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by a lack of white pigment on the lower jaw, throat and lower neck, with widely scattered tiny dark spots only. This trait it shares in common with *W. ocreatus* although the widely scattered spots are slightly more numerous in *W. ocreatus. W. microocellata sp. nov.*, has an absence of darker spots on the lower jaw, which then abruptly become common on the throat and lower jaw. *W. makhani* and *W. kimaniadilbodeni sp. nov.* have an even and well defined pattern of dark spots on the lower jaw, throat and lower neck.

W. tyeseeipperae sp. nov. has flecks of dark pigment configured to form a series of broken cross-bands running across the lower throat region. *W. scotteipperi sp. nov.* has minimal dark spotting on the lower jaw and upper throat, while the throat and neck effectively lack any dark spots. Furthermore in *W. scotteipperi sp. nov.* the lower flanks of the neck are white and effectively lack any dark spotting as seen in all of *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. microocellata sp. nov.*, *W. ocreatus* and *W. tyeseeipperae sp. nov.*.

W. microocellata sp. nov. is separated from *W. ocreatus* by the presence of numerous regular patterned dark flecks on each side of the head and a top of the head darker in colour than the body, versus irregular scattered dark flecks on a light background on each side of the head and a head of same colour as the upper body.

W. microocellata sp. nov. is further separated from all of *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by a unique dorsal pattern consisting of a strong reddish tinge running along the verterbral line and nearby parts of the upper back on the body, becoming greyish-black on the upper flanks, with a dorsal pattern consisting of tiny white squarish blotches on the dorsal surface of the forebody, tending to become tiny ocelli on the posterior part of the upper body, all against a mainly blackish-grey background.

Both *W. microocellata sp. nov.* and *W. kimaniadilbodeni sp. nov.* are separated from all of *W. makhani*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by the presence of a well defined dark curved line, bounded by white along the upper and lower side situated on the side of the supraciliary ridge on each side of the head.

W. microocellata sp. nov. is separated from all of *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* by the presence of prominent raised white spots on scales on the mid flanks of the base of the tail. *W. kimaniadilbodeni sp. nov.* has indistinct cream spots on the same raised scales. *W. ocreatus* has scattered black dots on some raised scales on the mid-flanks of the base of the tail.

Unlike the species *W. microocellata sp. nov.*, *W. kimaniadilbodeni sp. nov.* and *W. ocreatus* the three species *W. makhani*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov.* are characterized by a lack of any consistent configuration of raised coloured scales on the flanks of the upper tail. In all three there is at best widely scattered and irregular dark tipped scales. For these three species the flanks of the anterior tail are best described as grading gradually from the dark upper colour to the whitish venter colour, with all scales being of similar colour consistency, as opposed to dark or light coloured centres, contrasting with the nearby scale colour.

W. kimaniadilbodeni sp. nov. and *W. scotteipperi sp. nov.* are separated from all of *W. microocellata sp. nov.*, *W. ocreatus, W. makhani*, and *W. tyeseeipperae sp. nov.* by the fact that the upper labials above the eye are configured in alternating dark and light, being dark brown and yellowish white, the rectangular blotches giving the upper jaw a barred appearance. Under the eye, the upper labials of *W. ocreatus*, *W. makhani* and *W. microocellata sp. nov.* are either one colour, one colour evenly peppered with numerous dark flecks, or one colour with irregular dark flecks.

W. tyeseeipperae sp. nov. is separated from all of *W. kimaniadilbodeni sp. nov.*, *W. scotteipperi sp. nov., W. microocellata sp. nov.*, *W. ocreatus,* and *W. makhani* by the unique presence of irregular large blotches on a whitish background on the upper labials, not forming any barred configuration as well as a pattern of dense dark speckling on the neck, becoming more dense on the sides and giving a reticulated appearance, the darker flecks extending onto the lower neck.

W. tyeseeipperae sp. nov. is further separated from all of *W. kimaniadilbodeni sp. nov.*, *W. scotteipperi sp. nov., W. microocellata sp. nov.*, *W. ocreatus,* and *W. makhani* by the fact that the front of the tail is characterised by the fact that from about

row 11 past the pelvic girdle (back legs), the raised spines on the upper surface are all tipped with well-defined black spines, running to the end of the tail.

While all Western Australian species *W. tyeseeipperae sp. nov.*, *W. kimaniadilbodeni sp. nov.*, *W. microocellata sp. nov.*, and *W. ocreatus,* may have visible and prominent longitudinal stripes running along the rear end of the dorsal surface of the tail, this is not the case for any of the East Australian species, namely *W. makhani*, *W. scotteipperi sp. nov.*, or for that matter *W. storri.*

The longitudinal striping at the lower end of the tail in *W. tyeseeipperae sp. nov.* is prominent, versus prominent, but with lighter, but still well-defined dark and light stripes in *W. ocreatus* and these are indistinct in *W. kimaniadilbodeni sp. nov*. and *W. microocellata sp. nov.*.

W. tyeseeipperae sp. nov. is different from all of *W. kimaniadilbodeni sp. nov.*, *W. scotteipperi sp. nov., W. microocellata sp. nov.*, *W. ocreatus,* and *W. makhani* in that all but very aged specimens have the upper surface of the head including the snout characterised by distinctive dark markings on a very light background, versus a dorsal surface of the head being generally unmarked, or occasionally peppered in all the other species, the peppered condition being most commonly seen in *W. makhani.*

W. scotteipperi sp. nov. is separated from all of *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. microocellata sp. nov.*, *W. ocreatus*, and *W. tyeseeipperae sp. nov.* by a lack of any defined longitudinal striping at the latter part of the tail, save for a broken dorsolateral line, with the breaks being sufficiently wide to give the end of the tail an appearance of having cross-bands similar to those seen in the so-called "*acanthurus*" group of species.

Because *W. scotteipperi sp. nov.* has no such rings on the anterior part of the tail, it cannot possibly be confused with any of the so-called "*acanthurus*" group of species.

W. microocellata sp. nov. is readily separated from *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. ocreatus*, *W. tyeseeipperae sp. nov.* and *W. scotteipperi sp. nov*. by tail length in adults. In *W. microocellata sp. nov.* it is 1.8-1.9 times the body length, versus 1.7-1.8 times body length in the other five species.

In terms of the other three species found in the Kimberley and nearby parts of the Northern Territory, this is a significant difference and appears to be due to a character displacement event that may have occurred in the areas inhabited by the other three. Those species are all apparently sympatric with *W. kingorum* (in the NT) and a newly described similar species from the Ord River drainage in Western Australia, that had until now been treated as a western population of *W. kingorum*. *W. kingorum* occupies similar and same habitat as the other species and it's most significant difference is a more gracile build, including a tail that is more than 200% the length of the body.

Where both *W. kingorum* and *W. kimaniadilbodeni sp. nov.*, *W. ocreatus* or *W. tyeseeipperae sp. nov.*. occur in sympatry, *W. kingorum* is most common on large hills with large amounts of rock sheets across the ground, boulders and the like, whereas the other three are most common on rocky habitats between the hills if present, lower scree slopes and the like.

W. microocellata sp. nov. also appears to have a more elongate body and head than *W. kimaniadilbodeni sp. nov.*, *W. ocreatus* and *W. tyeseeipperae sp. nov.*.

The holotype of *W. ocreatus* and all live specimens inspected by this author from the type locality are of the same form and colour. They are reddish across the entire dorsal surface, overlain with fine black peppering, in a configuration that occasionally gives a slightly reticulated pattern on the upper body surface. This is quite unlike any other species of *Worrellisaurus.* Closest to this condition among the relevant species is *W. kimaniadilbodeni sp. nov.* which is orangeish yellow on top of the body with similar flecks to *W. ocreatus* with significant dark brown scales as flecks in a banded configuration on the venter, as opposed to limited dark scales on the venter of *W. ocreatus.*

W. tyeseeipperae sp. nov. is unusual among *W. kimaniadilbodeni sp. nov.*, *W. makhani*, *W. microocellata sp. nov.*, *W. ocreatus* and *W. scotteipperi sp. nov*. in that on the upper surface of the body, specimens lacks obvious spots, flecks, peppering or markings on all but the upper back, this being the normal condition for even younger specimens.

W. makhani and *W. scotteipperi sp. nov*. are both characterized by a dorsal colour pattern consisting of darker brown pigment overlain with lighter brown specking in clusters or longitudinal lines, tending to form small dark edged ocelli on the back, with lighter centres. In *W. makhani* these ocelli merge on the lower back to form semi-distinct vertebral lines, which is not the case in *W. scotteipperi sp. nov.*.

Specimens attributed to "*Varanus storri ocreatus*" have been collected from Christmas Creek Station, Western Australia (south-east of Fitzroy Crossing in the south-east Kimberley), as well as the Mornington Wildlife Sanctuary (southern central Kimberley) and 50 km east of Derby in the south-west Kimberley. These specimens have not been examined by myself and so their specific status is not known. Specimens attributed to "*Varanus storri ocreatus*" from north and west of the Drysdale River in Western Australia are referrable to *W. microocellata sp. nov.*.

Brown (2014) depicts a photo of *W. scotteipperi sp. nov.* in life on page 872, bottom right image.

Distribution: *Worrellisaurus scotteipperi sp. nov.* occurs in the general region of the hills on the southern edge of the Gulf of Carpentaria on the Northern Territory side of the Queensland border, within the vicinity of the type locality. It is not known if this taxon occurs elsewhere.

Etymology: Named in honour of Scott Eipper, husband of Tyese Eipper, both herpetologists of the south-eastern suburbs of Brisbane, Queensland, Australia, running the education business "Nature 4 You" wildlife demonstrations (www.wildlifedemonstrations.com) for services to herpetology spanning some decades.

WORRELLISAURUS DANNYBROWNI SP. NOV.

Holotype: A preserved specimen in the Western Australian Museum, Perth, Western Australia, Australia, specimen number: R117242, collected at 3 km south east of Yilbrinna Pool, Western Australia, Australia, Latitude -24.00 S., Longitude 118.54 E.

The Western Australian Museum, Perth, Western Australia, Australia is a government-owned facility that allows access to its holdings.

Paratype: A preserved specimen in the Western Australian Museum, Perth, Western Australia, Australia, specimen number: R117243, collected at 3 km south east of Yilbrinna Pool, Western Australia, Australia, Latitude -24.00 S., Longitude 118.54 E.

Diagnosis: *Worrellisaurus dannybrowni sp. nov.* would key out as *W. acanthurus* (AKA "*Varanus acanthurus*") using the key in Cogger (2000).

Worrellisaurus dannybrowni sp. nov. is best described layman's terms as a "red form" of *W. acanthurus*, although red *W. acanthurus* do also occur, making general colouration alone not a useful diagnostic of this taxon.

However this crude division does hold true for specimens in and around the Pilbara region of Western Australia, where *W. dannybrowni sp. nov*. and *W. acanthurus* do occur in close proximity, making it possible to reliably identify specimens of either at a glance in that region.

However for all *W. acanthurus*, be they blackish in general colour as is typical for West Australian specimens, yellow or red as in central and central eastern Australian specimens, possess well defined narrow yellow rings on the base of the tail on the upper side and flanks.

W. dannybrowni sp. nov. lack these well-defined yellow rings.

The dorsal ocelli on the back and flanks of *W. acanthurus* are of similar size throughout, whereas in *W. dannybrowni sp. nov*. these are noticeably larger on the midline and shrink significantly towards the mid flanks, disintegrating on the lower flanks, where they merge into the reddish pigment. By contrast the ocelli go down the flanks in *W. acanthurus* and meet with rectangular patches of white between these and the whiter venter.

W. dannybrowni sp. nov. is also significantly more thick-set than both *W. acanthurus* and the closely related *W. insulanicus* Mertens, 1958, and has a significantly shorter tail than both taxa. In adult *W. dannybrowni sp. nov*. the tail is 1.3 times the length of the body versus 1.4-1.5 times in *V. acanthurus* (including the synonymous *W. brachyurus* Sternfeld, 1919) and 1.6-1.7 times in *W. insulanicus* Mertens, 1958 (which also applies to the synonymous *W. baritji* (King and Horner, 1987)).

The limbs of all of *W. acanthurus* and the closely related *W. insulanicus* Mertens, 1958 (including synonyms) are invariably blackish in colour with well defined yellow spots and this is regardless of the overall general body colour of the animal. By contrast the limbs of *W. dannybrowni sp. nov*. are distinctly purplish

red in colour with well defined yellow spots on all four limbs.

Photos in life of both *W. acanthurus* and *W. dannybrowni sp. nov*. side by side can be found in Storr, Smith and Johnstone (1983) at plate 13, in photo 1 for *W. acanthurus* and photo 2 for *W. dannybrowni sp. nov*..

Further photos of typical *W. acanthurus* can be found in Cogger (2014) at page 764, and Wilson and Swan (2017) at page 461 at top.

Distribution: The exact limits of the distribution of *W. dannybrowni sp. nov*. are not certain, but the taxon appears to be restricted to the southern half of the Pilbara region in Western Australia, generally south of the Fortescue River drainage.

Etymology: Named in honour of veterinary surgeon, Danny Brown of Deception Bay in south-east Queensland for numerous services to herpetology spanning some decades. He is best known for his magnificent books about the keeping and breeding of reptiles, generally regarded as "best in class", the best known and largest volume being Brown (2014) as cited in this paper.

WORRELLISAURUS JENANDERSONAE SP. NOV.

Holotype: A preserved specimen at the South Australian Museum, Adelaide, South, Australia, Australia, in the Herpetology Collection, specimen number: R44782, collected at Wirramania South, South Australia, Latitude -31.20 S., Longitude 136.23 E.

The South Australian Museum in Adelaide, South Australia, Australia, is a government-owned facility that allows access to its holdings.

Paratype: A preserved specimen at the South Australian Museum, Adelaide, South, Australia, Australia, in the Herpetology Collection, specimen number: R21166, collected at South Olympic Dam, Roxby Downs, South Australia, Australia, Latitude -30.75 S., Longitude 136.87 E.

Diagnosis: Until now *W. jenandersonae sp. nov*. has been regarded as a variant of *W. gilleni* (Lucas and Frost, 1895). However the two taxa are readily separated on the basis of colour and markings.

W. gilleni is characterised by a dorsal pattern consisting of well-defined blotches on the dorsum arranged in well-defined broken crossbands. The head and neck are also dominated by lighter pigment overlain with a series of well defined darker spots and blotches.

By contrast *W. jenandersonae sp. nov*. has a dorsal body pattern consisting of ill defined spots and peppering with the same darker colour over the lighter background and with significant peppering on the sides of the head (including over the temporal streak) and the top of the head, this not being seen in *W. gilleni*.

There is also peppering between the main ill defined cross-bands in *W. jenandersonae sp. nov*., this not being seen in *W. gilleni.*

Photos of typical *W. jenandersonae sp. nov*. in life can (as of when this paper was written in 2018) be found online at: https://www.aussiepythons.com/forum/threads/herping-sa-pernatty-and-the-peninsula.200800/ (Mahony 2013).

Typical *W. gilleni* in life are depicted in Cogger (2014) at page 771 and Wilson and Swan (2017) at page 65 (top left).

Distribution: *W. jenandersonae sp. nov*. appears to be generally found in most of South Australia and into the far southern Northern Territory immediately south of Alice Springs. However the exact distribution limit of this taxon is not known. *W. gilleni* is found throughout the rest of the southern Northern Territory and eastern Western Australia, before it is replaced with *W. caudolineatus* in most of the south-west of that state and *W. bushi* in the Pilbara region.

In the east the distribution of *W. gilleni* extends to far western Queensland around Birdsville and north of there.

Etymology: Named in honour of Jen Anderson of Ringwood, Victoria, Australia working with the team at Snakebusters, Australia's best reptiles shows to educate people about Australian wildlife, including the science of discovering species and learning about them and the further steps required to conserve species. Dealing with erratic members of the public is not difficult when compared with dealing with others in the business space imitating our successful formula. We continually are finding ourselves having to fend off unlawful attacks from these people who are in the animal business space, but have no concern for the animals and are only in the business for money.

These criminals attack our staff at displays, make false complaints against us to divert our clients to their unsafe alternatives and so on, and Jen has to work on the coalface unnecessarily having to deal with these unlawful attacks, being diverted from what the Snakebusters team does best, which is working for wildlife conservation.

ACKNOWLEDGEMENTS

Luke and Gina Faba, lawyers at Stenta Legal, 1 Queens Road, Melbourne, Victoria, Australia, successfully retrieved some, but not all, relevant data and hard drives illegally seized by Glenn Sharp and Emily Gibson, claiming to be acting on the orders of Ron Waters, head of wildlife law enforcement at the State Government wildlife department on 17 August 2011 during a unlawful violent armed raid on the author's facility.

The trio, and the dozens of others they employed in their so-called "Operation Bassett" (as detailed in Victorian Civil and Administrative Tribunal 2015) all worked for the Victorian Government Wildlife Department (at the time called "DSE").

Their destructive armed raid, in which they also illegally killed numerous live reptiles held by the author, was found to be illegal by several courts of law after the fact, including by the Victorian Court of Appeal in 2014 and Victorian Civil and Administrative Appeals Tribunal (VCAT) in 2015.

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CONFLICT OF INTEREST

There are no conflicts of interest in terms of this paper and the author.