

A new species of *Notopseudonaja* Wells, 2002 (Squamata: Serpentes: Elapidae).

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ABSTRACT

The Australian Ringed Brown Snake, found in most drier parts of mainland Australia has until recently been treated by most Australian herpetologists as a single species, *Pseudonaja modesta* (Günther, 1872), *sensu* Cogger (2014).

Contrary to this position was Wells (2002), who erected a new genus *Notopseudonaja*, for the taxon originally named *Cacophis modesta* Günther, 1872, with a type locality of near Perth in Western Australia.

Wells (2002) furthermore resurrected the previously synonymised species *Furina ramsayi* Macleay, 1885, from the Barrier Ranges in west New South Wales as well as *Brachysoma sutherlandi* De Vis, 1884 from Carl Creek, Norman River in north-west Queensland.

Hoser (2013) adopted the Wells (2002) taxonomy and formally named the Kimberley form as *N. wellsi*.

A molecular and morphological study by Gregory in 2010 as part of his PhD wholly supported the taxonomy and nomenclature of Wells (2002) and hence the use of that taxonomy within this paper.

Gregory (2010) did also by implication cast doubt on the validity of the later named *N. wellsi*, implying it may be a junior synonym of *N. sutherlandi*, based on the number of rings on the body.

In any event, Gregory (2010) did identify an unnamed species found across most of South Australia and nearby parts of Queensland, the Northern Territory and Western Australia.

No one has sought to name that taxon in the intervening 12 years.

Hence that taxon is formally named herein as *N. rosswellingtoni* sp. nov..

Keywords: Taxonomy; nomenclature; Australia; Snake; Elapidae; *Notopseudonaja*; *Pseudonaja*; *modesta*; *sutherlandi*; *ramsayi*; *wellsi*; new species *rosswellingtoni*.

INTRODUCTION

The Australian Ringed Brown Snake, from most parts of mainland Australia has until recently been treated by most Australian herpetologists as a single species, *Pseudonaja modesta* (Günther, 1872), *sensu* Cogger (2014).

Contrary to this position was Wells (2002), who erected a new genus *Notopseudonaja*, for the taxon originally named *Cacophis modesta* Günther, 1872, with a type locality of near Perth in Western Australia.

The basis of the division of the genus *Pseudonaja* Günther, 1858 was a divergent morphology and ecology for this putative species.

Wells (2002) furthermore resurrected the previously synonymised species *Furina ramsayi* Macleay, 1885, from the Barrier Ranges in west New South Wales as well as *Brachysoma sutherlandi* De Vis, 1884 from Carl Creek, Norman River in north-west Queensland.

Hoser (2013) adopted the Wells (2002) taxonomy as logical and correct and formally named the Kimberley form as *N. wellsi*. That taxon was separated from others in the genus by its greater number of body bands, with Hoser (2013) of the belief that the form was restricted to the Kimberley District of Western Australia.

As part of the formal description, Hoser (2013) wrote: "Known only from the Kimberley region of Western Australia."

A molecular and morphological study by Gregory in 2010 as part of his PhD wholly supported the taxonomy and nomenclature of Wells (2002) and hence the use of that taxonomy within this paper.

Gregory (2010) did also in effect by implication, cast doubt on the validity of the later named *N. wellsi*, implying it may be a junior synonym of *N. sutherlandi*, based on the number of rings on the body, with Gregory finding putative specimens of this

form across the tropical north of Australia.

If *N. sutherlandi* and *N. wellsii* are conspecific, then the earlier name *N. sutherlandi* takes priority and *N. wellsii* becomes a subjective junior synonym.

As part of his study, Gregory (2010) did identify an unnamed species found across most of South Australia and nearby parts of Queensland, the Northern Territory and Western Australia.

There was doubt as to the exact identity of "*Furina ramsayi* Macleay, 1885" in that it was not certain whether or not it was of the east Australian clade or the South Australian / Centralian one.

However inspection of live specimens from the Barrier Ranges in New South Wales, including the two locations given as the type locality for "*Furina ramsayi*" (Silverton and Milparinka) and also inspection of the holotype for the putative taxon, has confirmed that the relevant snakes are of the east Australian clade.

Therefore the (mainly) South Australian / Central Australian form remains without an available name.

I note also that in the 12 years since Gregory published his relevant PhD, no herpetologist has sought to name the obviously unnamed taxon, which in terms of herpetology and science is untenable.

Therefore that taxon is formally named herein as *N. rosswellingtoni* sp. nov..

MATERIALS, METHODS AND RESULTS

These are outlined in the introduction and are summarised as follows.

Inspection of live and dead specimens from the across the putative range of *N. modesta* was carried out over a period spanning more than a decade, including the holdings at various State museums. Viewing of numerous photos of live specimens with good locality data was also conducted and found to be of great utility.

A sweep of the key references in terms of the putative species *N. modesta* was done to confirm the taxonomy and nomenclature current and that also available in terms of names for given populations.

Key references in terms of putative *N. modesta* that were consulted were Bush (1981), Bush and Maryan (2006), Cogger (2014), Cogger *et al.* (1983), De Vis (1884, 1889), Dittmer *et al.* (2020), Fry (1914), Gillam (1979), Gregory (2010), Günther (1858, 1872), Hoser (2009, 2012, 2013), Macleay (1885), Ride *et al.* (1999), Skinner (2009), Skinner *et al.* (2005), Sternfeld (1925), Swan *et al.* (2009, 2017), Wallach *et al.* (2014), Wells (2002), Wells and Wellington (1984, 1985), Wilson and Swan (2010, 2017) and sources cited therein.

Specimens of putative *N. modesta* from Silverton and Milparinka in western New South Wales, were inspected and conformed with the eastern form of the taxon as identified by Gregory (2010).

Within his PhD paper, Gregory (2010) stated that in an analysis, the type for "*Furina ramsayi* Macleay, 1885" was in some ways closer to the South Australian / Centralian form than the eastern form for certain traits, but my viewing of the relevant material found the reverse to be the case and the relevant traits investigated by Gregory being highly variable in both taxa.

Both species do overlap in many characters and are morphologically very similar.

A photo of the holotype was inspected by myself and blown up for close examination.

The feature of the holotype that made it clear "*Furina ramsayi* Macleay, 1885" was of the eastern form and not the South Australian / Centralian form was the condition of the black body bands having obviously jagged anterior or posterior edges, a trait typical of the eastern form.

South Australian / Centralian ones (defined here as being mainly in South Australia), have borders on the bands that are generally

even and not jagged.

In terms of distribution Australia-wide, the various clades do have certain features in areas the ranges abut or overlap.

The newly named form, *N. rosswellingtoni* sp. nov. seems to dominate in sandy and flat areas.

By contrast, the type form of *N. modesta* with a centre of distribution in the western two thirds of Western Australia dominates in hilly and elevated shield areas, such as the Pilbara and Gascoyne regions of Western Australia.

A good example of the relative dominance of each form is seen in the Pilbara where *N. modesta* dominates, but along the Fortescue River barrier *N. rosswellingtoni* sp. nov. makes an appearance.

Conversely in the eastern third of Australia, *N. ramsayi* dominates in hilly and near hilly areas, including self-evidently in the Barrier Range.

N. sutherlandi / *N. wellsii* dominate in the hilly areas of the tropics but makes no major incursions south to the more hyper-arid areas.

Queensland *N. sutherlandi* appear to be separated from *N. wellsii* and similar patterned snakes in the Northern Territory by the Barkly Tableland which has either *N. modesta*, *N. ramsayi* or both.

This fact implies that *N. sutherlandi* (with 11 body bands) from western Queensland and *N. wellsii* (with 9-12 body bands) from the Kimberley in Western Australia are sufficiently divergent to be treated as two separate species or subspecies, although the molecular results of Gregory (2010) do not support that contention.

It appears that in the recent geological past, populations of putative *N. modesta* have contracted in range, at which time speciation has occurred and then when re-expansion of populations has occurred, the various newly formed taxa have as a rule excluded one another from areas inhabited already.

Where ranges abut, character displacement appears to have occurred with either form occupying a habitat type they appear to have a relative advantage in.

As already mentioned the South Australian / Centralian form is sufficiently divergent from the other already named forms to warrant being treated as a separate species, especially with regards to a lack of evidence of cross-breeding with other populations.

Therefore it is formally named as a new species below.

NOTOPSEUDONAJA ROSSWELLINGTONI SP. NOV.

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Holotype: A preserved specimen at the South Australian Museum, Adelaide, South Australia, Australia, specimen number R68019, collected from 4.45 km north north-west of Tarcoola, South Australia, Australia, Latitude -30.6911 S., Longitude 134.5222 E. This government-owned facility allows access to its holdings.

Paratypes: 1/ A preserved specimen at the South Australian Museum, Adelaide, South Australia, Australia, specimen number R13966 collected from the south-east corner of Lake Everard, South Australia, Australia, Latitude -31.63 S., Longitude 135.43 E. 2/ A preserved specimen at the South Australian Museum, Adelaide, South Australia, Australia, specimen number R14357 collected from Glenloth Goldfields, 32 km south west of Kingoonya, South Australia, Australia, Latitude -31.08 S., Longitude 135.10 E.

Diagnosis: Until now, *Notopseudonaja rosswellingtoni* sp. nov. has been treated as a South Australian / Centralian population of *N. modesta* (Günther, 1872), type locality west, Western Australia, placed by most recent authors, including Cogger (2014) in the genus *Pseudonaja* Günther, 1858, rather than *Notopseudonaja* Wells, 2002.

N. rosswellingtoni sp. nov. is readily separated from both *N.*

sutherlandi (De Vis, 1884), (with 11 body bands) with a holotype from north-western Queensland and *N. wellsi* (Hoser, 2013), type locality north Kimberley district, Western Australia (with 9-12 body bands) by having 5-8 body bands, with *N. sutherlandi* and *N. wellsi* possibly being conspecific, as both those putative taxa occur in northern Australia, although populations of each are apparently split from one another in the east of the Northern Territory.

N. rosswellingtoni sp. nov. with a centre of distribution in the State of South Australia and including nearby parts of south-west Queensland, southern Northern Territory and eastern Western Australia, extending west towards the coast along some major river valleys, *N. modesta* found mainly in western Western Australia and *N. ramsayi* (Macleay, 1885), with a distribution centred on the Murray Darling and Cooper's Creek basins as well as the Barrier Range (NSW) all have 8 or less body bands.

N. rosswellingtoni sp. nov. is however separated from *N. modesta* and *N. ramsayi* by having a fore-nasal height divided by head length to end of skull that is greater than 0.0875, versus less than or equal to 0.0875 in *N. modesta* and *N. ramsayi*.

N. rosswellingtoni sp. nov. is further separated from both *N. ramsayi* and *N. modesta* by having body bands that are not jagged edged either anteriorly or posteriorly, and furthermore is separated from *N. ramsayi* by having a relatively narrow pale interspace between the black patch centred on the head between the eyes and the second black patch behind the head (at the top median line). In *N. ramsayi* the pale interspace (at the top median line) is nearly as wide as the black bar behind it, versus far from it in *N. rosswellingtoni* sp. nov. (and *N. modesta*).

While colouration of specimens varies, *N. rosswellingtoni* sp. nov. tends to be orangeish in colour, versus more a salmon colour in *N. ramsayi*. *N. modesta* is separated from the two preceding species by having a strong yellowish or brown hue on the dorsum.

N. sutherlandi and *N. wellsi* are both (further) separated from the other species in the genus by having a pale interspace between the black on the front of the head and at the nape that is posterior, that is as wide or wider than the black mark behind it (at the top medial line), versus not so in the other species.

Notopseudonaja Wells, 2002 are separated from morphologically similar species in the genus *Pseudonaja* Günther, 1858 by having a combination of 17 mid-body scale rows and less than 175 ventrals, versus more than this number in all species of *Pseudonaja*.

The morphologically similar genus *Placidaserpens* Wells, 2002, comprising two known species (*sensu* Gregory 2010), being *P. guttata* (Parker, 1926) and *P. whybrowi* (Hoser, 2009), is in turn separated from both *Notopseudonaja* Wells, 2002 and *Pseudonaja* Günther, 1858 by having 21 mid-body scale rows, versus 17 or 19 in the other two genera.

The genus *Oxyuranus* Kinghorn, 1923 being the most closely related other genus to *Notopseudonaja* based on the molecular evidence published by Gregory (2010) is readily separated from *Notopseudonaja*, *Placidaserpens* and *Pseudonaja* by the unique combination of a single anal plate (versus double in the other species), 21 or more mid-body scale rows, a distinctively rectangular head, thin neck, with obviously raised (keeled) scales on the dorsal surface of the neck, enlargement of the sheath covering the fangs and slight enlargement of the posterior body, in contrast to the relatively even body shape of the other species.

The genera *Placidaserpens* Wells, 2002 and *Notopseudonaja* Wells, 2002 are both supported by the genetic evidence of Gregory (2010) as being distinct from *Pseudonaja*. However at the present time, most publishing Australian herpetologists, including Cogger (2014), pretend that this is not the case and continue to synonymise both within *Pseudonaja*. The holotype of *N. modesta* is depicted on page 19 of Gregory

(2010).

The type form of *N. modesta* in life is depicted in Wilson and Knowles (1988) on page 342 at top left, Cogger (2014) at page 927 top right and online at:

<https://www.flickr.com/photos/194274402@N06/51648693568/>

The holotype of *N. ramsayi* is depicted on page 20 of Gregory (2010).

N. ramsayi in life is depicted in Wilson and Swan (2017) on page 585 at top, Swan *et al.* (2009) on page 255 and online at:

https://www.flickr.com/photos/gazs_pics/44965089034/

The holotype of *N. sutherlandi* is depicted on page 19 of Gregory (2010).

N. wellsi in life is depicted online at:

<https://www.inaturalist.org/observations/9901577>

N. rosswellingtoni sp. nov. is depicted in life online at:

<https://www.flickr.com/photos/jaricornelis/40476007993/>

Distribution: *N. rosswellingtoni* sp. nov. has a centre of distribution in the State of South Australia and including nearby parts of south-west Queensland, southern Northern Territory and eastern Western Australia, extending west towards the coast along some major river valleys.

Conservation: No species in the genus *Notopseudonaja* Wells, 2002 is of immediate conservation concern or known threats, notwithstanding the relevant comments of Hoser (1989, 1991, 1993, 1996, 2019a, 2019b).

Etymology: The new species *N. rosswellingtoni* sp. nov. is named in honour of Cliff Ross Wellington of Ramornie, northern New South Wales, Australia in recognition of his many contributions to Australian herpetology, that go well beyond two publications he is a well-known co-author of, namely Wells and Wellington (1984 and 1985).

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CONFLICTS OF INTEREST - NONE.

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