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A reclassification of the True Cobras; species formerly referred to the Genera *Naja, Boulengerina* and *Paranaja.*

Raymond Hoser

488 Park Road, Park Orchards, Victoria, 3114, Australia.
***Phone*: +61 3 9812 3322 *Fax*: 9812 3355 *E-mail*: adder@smuggled.com**

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ABSTRACT

Recent studies of so-called "True Cobras" by different authors have been consistent in ascertaining the relationships between taxa. This includes the identifying of four major well-defined clades, the relationships of which had for a long time been confusing due to apparent convergence in recent evolution.

Genus names are available for two of the four. The remaining two genera are formally diagnosed and named herein.

Included within these newly identified and named genera are the majority of African species.

***Keywords*:** snake, Cobra, taxonomy, *Spracklandus* gen. nov., *Wellsus* gen. nov., *Naja*, *Boulengerina*

INTRODUCTION

Cobras are well-known and medically significant snakes that are common in populated parts of Africa and Asia, including the Indian Subcontinent and most of Africa.

They are elapid species, meaning they have more-or-less tubular fangs fixed at the front of the mouth

Most species are moderate to large as adults, averaging from one to two metres in length and most are either dangerous or potentially dangerous to humans, with most species being blamed for human deaths at one time or other. As a group of snakes, many thousands of deaths are attributed to Cobras annually.

They are best recognised by the fact that the neck region is dilatable, the ribs being elongate, which forms the so-called "hood" characteristic of the group.

The genus *Naja*, has been in existence since 1768 and at various times included a vast array of taxa long since moved to other genera. Included here are the King Cobra (*Ophiophagus*) from Asia.

Other so-called Cobras, sometimes ascribed to a so-called "core Cobra group" (Slowinski and Keogh 2000), or snakes better described as similar, but very distantly related, have been moved to other genera such as *Hemachatus* (Rinkhals), *Pseudohaje* (Arboreal Cobras), *Aspidelaps* (Shield-nosed Cobras) and *Walterinnesia* (Desert Black Snake).

These snakes and the remaining True Cobras have been shown to be within a large related group (Slowinski et. al. 1997, Slowinski and Keogh 2000).

In terms of the remaining True Cobras (*Naja* as defined by most authors post 2000) and excluding

those ascribed to the genera listed above (but including those ascribed to the genera *Boulengerina* and *Paranaja* by recent post 2000 authors), most species fit the role of a generalised large venomous snake predator.

That is they grow to about a metre in length or more, feed principally on rodents and occupy almost any kind of available habitat, so long as they can find the essential life-giving elements of heat (or rarely escape from it), water, cover and food (in that order of importance).

Within a given range of a taxon, the distribution tends to be fairly continuous.

In spite of the prominence of the species, not all are believed to have been formally named and described, either in Africa or even the heavily populated region of south-east Asia, where what at one time was regarded as a single wide-ranging species has now been split into several.

Until now, most authors have referred the so-called True Cobras into a single genus, *Naja*. However more specialised forms have been placed into their own genera, most notably, *Boulengeria* (the so-called Water Cobras) and *Paranaja* (the Many Banded or Burrowing Cobras). However recent studies have consistently placed these rainforest genera as either within or closely related to the other *Naja* (as defined until now).

In terms of defining taxa at the species level, these are defined in most recent regional texts, save for taxa described in the past decade (see for example Wüster and Broadley 2003, 2007), all of which have resulted from so-called splits from other well-known taxa, with those authors also providing useful keys for separating given known taxa, which are relied upon here as additional parts of necessary descriptions of taxa at species or genus level if required. Hence at the genus level, including as defined in this paper, newly described taxa can be easily ascribed to a given genus.

In terms of defining taxa at the genus level, the underlying question becomes whether or not (in this case) the True Cobras are monophyletic or paraphyletic.

Notwithstanding the inevitable question as to how far back in time one goes before drawing the line of common ancestry, in terms of this question in terms of the True Cobras, most authors have opted for the idea of the group being paraphyletic.

Included here are, Keogh (1998), Slowinski et. al. 1997, Slowinski and Keogh 2000 and Nagy et. al. 2005.

All authors noted the inclusion of the genera *Boulengerina* and *Paranaja* (as then defined) within the group known as the True Cobras and used this as their main basis of argument.

More recently, Wüster et. al. 2007, (fig. 4) as the most recent taxonomic treatment of the group (excluding Kelly et. al. 2009) provided evidence to show that both *Boulengerina* and *Paranaja* were nested within a well-defined clade of species including *Naja* (the species *melanoleuca*) (as previously defined by other authors), which confirmed work of earlier authors such as Nagy et. al. (2005) and Slowinski et. al. (1997) based on different data sets.

As a result Wüster et. al. (2007) synonymised both within what they in effect defined as a greater *Naja*.

While recognising the questionable move of redefining the said snakes within *Naja*, the authors justified it on the basis of the concept that their move would minimise potential destabilising of the nomenclature (p. 445 of their paper).

While not explicitly stating so, I assume this refers to the ICZN's 1999 code (the current one), (ICZN 1999) which Wüster in particular frequently refers to in other publications and his countless internet posts.

Although not explicitly saying so, it is assumed that Wüster et. al. 2007 used the same reasoning not to split the Asian and Africa *Naja* (as defined by them) into different genera.

In conflict with Wüster et. al., I contend that the code does not call for "no change" and that "no change" is not a correct interpretation of the ICZN's rules in terms of stability of names.

In referring to the principles of the code, I note principle number one of the rules which reads:

> "(1) The Code refrains from infringing upon taxonomic judgment, which must not be made subject to regulation or restraint."

The code in other words explicitly does not call for "no change".

In terms of the desire for stability of names this is generally self-regulated by the application of the code through the applications of the generally binding principals of priority and homonymity.

Hence, once a taxon is properly named, both preceding rules, ensure the perpetuity and stability of the name.

The so-called "stability provisions" are usually only invoked where a long-forgotten name is set-aside in favour of a newer well-used one for a given taxonomic grouping.

In terms of the groups of True Cobras described herein, this issue of stability conflict doesn't apply, as neither of the new groups named herein have pre-existing or "available" names at the genus level

requiring exceptional application of the ICZN's rules or intervention by the ICZN itself.

The relevant section of the code is principal four, which reads:

> "(4) Nomenclatural rules are tools that are designed to provide the maximum stability compatible with taxonomic freedom. Accordingly, the Code recognises that the rigid application of the Principle of Priority may, in certain cases, upset a long-accepted name in its accustomed meaning through the validation of a little-known, or even long-forgotten, name. Therefore the rules must enable the Principle of Priority to be set aside on occasions when its application would be destructive of stability or universality, or would cause confusion. For use in such cases the Code contains provisions that modify the automatic application of the Principle of Priority, whether it concerns the establishment or precedence of names, the fixation of name-bearing types, the spelling of a name, or any other matter."

As just stated, the principal of priority combined with that of homonymity are the main tools by which the ICZN's rules guarantee stability of nomenclature most of the time.

The relevant sections of the code in these regards are articles 23 and 52

They read as follows:

> "23.1. Statement of the Principle of Priority. The valid name of a taxon is the oldest available name applied to it, unless that name has been invalidated or another name is given precedence by any provision of the Code or by any ruling of the Commission."
>
> And:
> "Article 52. Principle of Homonymy.
>
> 52.1. Statement of the Principle of Homonymy. When two or more taxa are distinguished from each other they must not be denoted by the same name.
> 52.2. Operation of the Principle of Homonymy. When two or more names are homonyms, only the senior, as determined by the Principle of Priority (see Article 52.3), may be used as a valid name; for exceptions see Articles 23.2 and 23.9 (unused senior homonyms) and Article 59 (secondary homonyms in the species group).
> 52.3. Principle of Priority applies. The relative precedence of homonyms (including primary and secondary homonyms in the case of species-group names) is determined by applying the relevant provisions of the Principles of Priority and the First Reviser [Arts. 23, 24]."

Wüster et. al. 2007 clearly showed that the non-spitting cobras from Africa also formed

a distinct lineage, and yet with closest affinities to the group consisting of *Boulengerina Paranaja,* and the taxon identified by most authors as "*Naja melanoleuca*".

The authors chose not to assign these snakes to any new genus and again referred them to their greater *Naja*.

In terms of the spitting species, they formed (as expected) a well defined clade and with quite ancient origins. Again these snakes were left within the greater *Naja* as were the Asiatic True Cobras.

In terms of taxonomy, Wüster himself denies any bias (as most people would), but has conceded that he believes most of his peers in other areas, such as mammals, are prone to too much splitting of genera and has even stated a belief that humans and chimps should both be placed in the same genus (Wüster 2009).

In that internet post he wrote:

> "It is also well known that mammals and birds are oversplit compared to other animals - I'd be quite happy with *Pan sapiens* myself."

This paper is not about spending too much time arguing with Wüster's general views on taxonomy and how far back to draw the line in terms of defining phylogeny.

It is sufficient to say that I do not agree with his position.

In terms of the True Cobras it is my considered view that 10 million years is a sufficient time line in terms of separating various genera, especially if and when there are obvious diagnostic features by which to separate the component taxa, which in this case there clearly is.

Based on Wüster et. al.'s fig 4. (Wüster et. al. 2007), or those similar figures provided more recently by Kelly et. al. (2009), this would mean that there would be four full genera subsumed within the so-called "greater *Naja*".

(Note that the term "Greater *Naja*" has been coined here, and not by Wüster et. al. 2007 to describe what they in effect laid out).

Wüster's credibility as an author has been discussed elsewhere (see Hoser 2009a, 2009b, 2009c and many references cited therein) and I won't detail my doubts here.

Likewise, numerous studies have shown serious errors in estimates based on molecular data that had been touted as correct (Palquerio and Nichols 2006), which also forms the main basis of Wüster et. al.'s 2007 findings.

However the splitting of *Naja* as defined by Wüster et. al. 2007 into the same or similar component groups has occurred in similar studies by other authors including Fry et. al. (2003a, 2003b)(with Wüster as co-author), Kelly et. al. (2009)(see figure on page 45 for example)(Keogh 1998), page 188) and many others using other criteria and data, making Wüster's data merely corroborative of others and hence not in this case "high risk".

Wüster et. al's 2007 paper is however widely posted on the internet, whereas most of the others are not, so due to it's accessibility to people has been used here for citation purposes and to allow readers to view the basis of the generic divisions within this paper.

This obviously is also because the genus group divisions made herein are also well demarcated and easily seen in the data presented by Wüster et. al. 2007.

Importantly, Wüster et. al. 2007 is referred to here as I anticipate Wüster to be a loud objector to the taxonomic and nomenclatural position of this paper (see later herein) and to counter this I rely on his own data as he has presented it (even though I could easily ignore his material to arrive at the same conclusions).

All four genera are defined, diagnosed and named herein, including two for the first time.

For the benefit of readers, the estimated approximate timelines of divergence as given by Wüster et. al. 2007 are as follows:

1 - Asian True Cobras (*Naja*) 25 MYA (million years ago) (minimum 16 MYA)

2 - Spitting Cobras (*Spracklandus* gen. nov.) 23 MYA)

3 - Non-spitting Cobras (*Wellsus* gen. nov.) 21 MYA

4 - Boulengerina group (*Boulengerina*) 21 MYA

These timelines are for divergence from remaining members of the group that have not been already identified as diverging.

The figures of Kelly et. al. (2009) are more conservative, but in the same general ball-park.

The genus *Paranaja* Loveridge, 1944 as previously defined falls within the *Boulengerina* clade and as a name postdates *Boulengerina*. Hence it is herein synonymised with it as a junior synonym.

This remains the case unless or until someone at a future date resurrects the name for assigning the said taxa at genus or subgenus level.

True Cobras have been referred to other genera, including for example *Coluber*, but all other names are for one reason or another unavailable. They are not listed herein.

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

Notably in many of these cases the timelines of divergence of the component genus level taxa have post-dated the timelines given for divergences of the True Cobras described herein.

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

NOTES ON THE FOLLOWING DESCRIPTIONS

Detail has been kept to a minimum.

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

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

Following are descriptions and diagnosis of the relevant genera, firstly being those for which genus-level names are available.

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

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

No subgenera are defined in this paper.

The various species within each newly diagnosed and described genus, are generally identified under the name of the new genus, but are readily identifiable by their species names (unchanged from earlier literature).

Excluding the newly named taxa as identified herein, all others are described and diagnosed in the cited regional texts either as species or subspecies.

These texts are:

Boycott and Haacke (1979), Branch (1969, 1988), Broadley (1958, 1968, 1974, 1998), FitzSimons (1970), Pitman (1974) for African taxa, Egan (2007), Joger (1984) and van der Kooij, (2001) for near and Middle-east taxa and Deoras (1965), Reitinger (1978), Sharma (2004), and Whittaker (1978) for the Asiatic taxa.

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

A number of well-recognised subspecies have been shown to be species in their own right by recent authors and for others, there remains a question mark in terms of whether they are species or subspecies.

Numerous herpetologists are working on these taxa at present and it is not my intention to usurp their positions to formally name species and subspecies level taxa herein.

Many useful studies inspected and assessed are not cited in this paper or at it's end as they are not directly referred to in the text of this paper and/or key findings and/or their conclusions are mirrored in material cited herein. The majority of referred to papers are however cross-cited in the limited number of references provided.

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

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

Alternatively, species level descriptions and/or diagnosis are available for all species level taxa described prior to the dates of the references cited above (in full below).

Some are described and diagnosed in these texts as subspecies, but listed as full species here.

Alternatively, one or more species level taxa may have since been described as full-species as a result of being "split" from known taxa, one such example being the species *ashae*, split off from *nigricollis* (Wüster and Broadley 2007), but still readily referrable to the Spitting Cobra group, herein described as *Spracklandus* gen. nov..

In the preceding case, the newly described taxon had been mistaken as a colour variant of another similar species.

The True Cobra species not included in the above texts, but described since are readily aligned to other taxa in their respective groupings at genus level and in the absence of other information, would be easily diagnosed in the said genus.

DEFINITION OF THE TRUE COBRAS

True Cobras for the purposes of this paper are defined as follows:

All are elapid snakes; that is they have fixed (not movable) tubular (but partly canalised) fangs mounted at the front of the mouth, usually concealed by a movable sheath, known as the vagina dentalis.

The pupil is round, meaning most species are mainly diurnal.

The ventral scales are nearly as broad as the belly.

They have smooth scales, wide neck and head and a medium body. In terms of adult size, they are moderate to large and many are dangerously venomous.

The neck region is dilatable, the ribs being elongate. The expansion of the region forms the hood which best defines snakes of the group to a layperson.

Snakes in other groups sometimes share this trait, but not to the same extent, with the possible exception of the genus *Ophiophagus.*

In Asia, the True Cobras are most likely to be confused with the King Cobra, genus *Ophiophagus*, which is separated by the following suite of traits, including:

The frontal is not truncated;

The enlarged supralabial just touches the nasal and the eye;

There is no triangular scale wedged in between the fourth and fifth infralabials;

There's a pair of occipital scales present beyond the parietal and;

The first (near anal plate) subcaudals are divided.

In Africa, this group of snakes is most likely to be confused with the Rinkhals, genus *Hemachatus*. The latter is separated by the strongly keeled scales dorsally (17-19 rows) with keeled scales (apical pits) along the body and onto the tail, 116-150 ventrals (lower count), more flattened body and a proportionately broader head.

So-called “Arboreal Cobras”, of the genus *Pseudohaje* are differentiated from *Naja* by the lack of any meaningful hood, only 13-15 mid-body rows, versus more for True Cobras, more mandibular and other teeth and relatively smaller fangs.

Two known species of snake in the genus *Walterinnesia* (commonly called Desert Black Snake or Desert Cobra) are differentiated from the True Cobras by their more cylindrical body shape and short tail. Unlike true Cobras the posterior scales are weakly keeled. They are found in the middle-east.

So-called Shield-nosed Cobras, *Aspidelaps* (2 known species), are separated from similar species, including the True Cobras by their enlarged rostral scale and less developed hood region.

The True Cobras are distributed in Africa, Asia and immediately adjacent regions, such as the middle-east, including islands off the continuously connected continental land masses.

One genus, *Naja* is known only from Asia, west to Iran. The other three genera, including the two named herein are mainly African and the range of these and *Naja* is not known to overlap.

As a family, the elapid snakes have a global distribution, although the relationships between those from the Americas and the old world are uncertain.

The centre for evolution of the True Cobras seems to be sub-Saharan Africa, where species diversity seems greatest.

GENUS *NAJA*

Type species: *Naja naja* Laurenti 1768

Diagnosis: Any of the following, either singly and/or in combination.

Including the general description of true Cobras above.

This genus is identified by the smooth oblique scales on the body, with 25-35 rows on the neck, 21-25 mid body rows, 15-17 rows at the vent. The 43-56 subcaudals are all divided. Ventrals range from 164-200.

There are seven supralabials, with only the third in contact with the nasal and the eye.

Maxillary bone extends beyond the palatine. The fangs are usually followed by 1-3 small teeth.

The nostrils are between an anterior and posterior nasal scale. There’s no loreal.

The scales on the body are placed obliquely. The eyes are round and more or less equal in diameter to it’s distance from the mouth. The nostrils are large and more-or-less vertically elliptic, the frontal is larger than broad, with a truncate anterior margin.

The internasals are as long as or a little shorter than the prefrontal, the preocular is usually in contact with the internasal.

The genus is distributed from the Caspian Mountains (also known as the Elburz Mountains) and east, including south-east Asia. The westernmost species is *N. oxiana*.

No other True Cobra genus is found where *Naja* presently occur.

The other three genera diagnosed below are all from Africa and/or the immediately adjacent middle-east.

Naja can be separated from the other True Cobras by the diagnosis for each as given below (herein incorporated in this diagnosis), either individually and/or in combination and/or by a process of elimination.

Species in genus *Naja*:

Naja naja (Linnaeus 1758)

Naja kaouthia Lesson 1831

Naja siamensis Laurenti 1768

Naja sputatrix Boie 1827

Naja samarensis Peters 1861

Naja atra Cantor 1842

Naja sumatrana Muller 1890

Naja philippinensis Taylor 1922

Naja mandalayensis Slowinski and Wüster 2000

Naja oxiana (Eichwald 1831)

Naja sagittifera Wall 1913

GENUS *BOULENGERINA* DOLLO 1886

Type species: *Naja annulata* Buchholz and Peters 1876

Diagnosis: Any of the following, either singly and/or in combination.

Including the general description of true Cobras above.

Boulengerina is separated from other Cobra genera by eliminating them as possibilities.

Wellsus gen. nov. is separated from *Boulengerina* by the fact rostral is broader than deep, the internasals are shorter than the prefrontals, the posterior chin shields are in contact with one another mesially or at most completely separated posteriorly; 23-27 scale rows across the neck (rarely 29), 19-21 mid body rows (rarely 17), and 13 preanal rows, 197-218 ventrals 60-70 subcaudals.

For *Naja* and *Spracklandus* gen. nov. (see below) the third supralabial is the only one entering the orbit.

In *Boulengerina* the third and fourth supralabial enter the orbit.

Spracklandus gen nov. (see below) has six upper labials, as opposed to seven in *Boulengerina*.

Boulengerina can be separated from the other True Cobras by the diagnosis for each as given above and below (herein incorporated in this diagnosis), either individually and/or in combination.

The group in this genus are primarily rainforest dwelling.

Species in genus *Boulengerina*:

Boulengerina annulata (Bucholz and Peters 1876)

Boulengerina christyi Boulenger 1904

Boulengerina multifasciata (Werner 1902)

Boulengerina melanoleuca (Hallowell 1857)

***WELLSUS* GEN. NOV.**

Type species: *Coluber haje* Linnaeus 1758

Diagnosis: Any of the following, either singly and/or in combination.

Including the general description of true Cobras above.

In *Wellsus* gen. nov. the upper labials are completely separated from the orbit by the suboculars (as seen in *W. hajae*), or if in contact, at both third and fourth supralabials (also see diagnosis for *Naja* above).

For *Naja* and *Spracklandus* gen. nov. (see below) the third supralabial is the only one entering the orbit.

Spracklandus gen. nov. is separated from the genera *Wellsus* gen. nov. and *Boulengerina* by the fact that the sixth upper labial is not the largest of the labials, in contrast to the other genera.

Spracklandus gen. nov. is separated from *Naja* by the consistently higher subcaudal count of 56-70, versus 43-56 subcaudals in *Naja*.

Spracklandus gen. nov. is also separated from the other true Cobras by the presence of twin pre-ocular scales. Occasional variation in the species taxa *pallida* and *nubiae* still readily refer to this condition.

Wellsus is separated from *Boulengerina* by the fact rostral is broader than deep, the internasals are shorter than the prefrontals, the posterior chin shields are in contact with one another mesially or at most completely separated posteriorly; 23-27 rows across the neck (rarely 29), 19-21 mid body rows (rarely 17), and 13 preanal rows, 197-218 ventrals 60-70 subcaudals.

Wellsus gen. nov. can be separated from the other True Cobras by the diagnosis for each as given above and below (herein incorporated in this diagnosis), either individually and/or in combination.

Etymology:

Named after Richard Wells a well-known and often vilified herpetologist from Australia most noted for his history-making forays into taxonomy. In the period 1983/5, he published as senior author a pair of large papers reclassifying the Australian herpetofauna (cited here as Wells and Wellington 1983, 1984). It was the subject of attempted suppression at the ICZN, which ultimately failed (ICZN 1991).

Many hundreds of species and new genera were named and described to the immense disdain of rivals in the field of herpetology, who viewed Wells and his co-author as “scooping” their perceived “naming rights”. Wells was held up to public ridicule and contempt and he was subjected to a concerted campaign of character assassination.

He was and still is regarded by many as a potential holotype for the concepts of poor species descriptions, taxonomic exaggeration and the like.

However with the benefit of history and work by others, it seems that the majority of his taxonomic and nomenclatural acts were in fact correct, even if in the first instance based on apparently little written evidence.

A further accusation commonly levelled against Wells was that he really didn’t have a clue about what he was writing and that he knew little about reptiles. In other words he was a bit of an idiot just making guesses.

Nothing could be further from the truth.

His broad expertise on Australian herpetofauna is perhaps unrivalled in terms of identification and taxonomic matters as is his grasp of the relevant literature.

If he were half as stupid as alleged, it wouldn’t have been possible for him to successfully name and diagnose so many valid taxa at both species and genus levels.

In other words, he couldn’t have possibly have made so many lucky guesses.

In summary, Wells had one major problem. He was about 50 years ahead of his time!

All the preceding is in no way a blanket endorsement by myself of Wells or his work and I have had pitched battles against him in the past over a whole range of matters and will probably again have disputes with him in the future.

In fact we only tolerate one another by agreeing to disagree on a whole raft of matters, which is again a partial endorsement of him in that he is sensible enough to know when to give up an argument.

However, it is appropriate that his huge contribution to herpetology, both by direct deed and influence on others be recognised by the naming of a prominent snake genus after him.

Species in *Wellsus* gen. nov.

Wellsus haje (Linnaeus 1758)

Wellsus nivea (Linnaeus 1758)

Wellsus annulifera (Peters 1854)

Wellsus anchietae (Bocage 1879)

Wellsus annulifera (Peters 1854)

***SPRACKLANDUS* GEN. NOV.**

Type species: *Naja nigricollis* Reinhardt 1843

Diagnosis: Any of the following, either singly and/or in combination.

Including the general description of true Cobras above.

Similar to the genus *Naja* in that the third supralabial is the only one entering the orbit.

Also has six upper labials, as opposed to seven in *Boulengerina*.

Separated from the other two mainly African genera, (*Wellsus* gen. nov. and *Boulengerina*) by the same feature.

Further separated from the genera *Wellsus* gen. nov. and *Boulengerina* by the fact that the sixth upper labial is not the largest of the labials, in contrast to the other genera.

Spracklandus gen. nov. is separated from *Naja* by the consistently higher subcaudal count of 56-70, versus 43-56 subcaudals in *Naja*.

This genus is also separated from the other true Cobras by the presence of twin pre-ocular scales. Occasional variation in the species taxa *pallida* and *nubiae* still readily refer to this condition.

Known as the spitting Cobras, specimens of this genus are also characterised by the presence of a modified opening high in the fang, enabling the fang to discharge venom with force from muscular contraction, the spray being in a jet at an angle of about 90 degrees.

Other true Cobras (of other genera diagnosed here) can "spit" as well, but not anywhere near the degree seen in these snakes, due to the absence of this well-developed spitting mechanism and hence all are generally termed non-spitting Cobras.

Spracklandus gen. nov. can be separated from the other True Cobras by the diagnosis for each as given above and below (herein incorporated in this diagnosis), either individually and/or in combination and/or by a process of elimination.

Spracklandus gen. nov. is an exclusively African genus, being found only to regions south of southern Egypt, including most of Africa south to and including South Africa.

Until 1968, all species within this genus were regarded as a single species (Broadley 1968, 1974), namely *nigricollis*.

Etymology:

Named after Robert Sprackland, a well-known USA-based herpetologist.

Like Wells (see above), he has also published on taxonomic matters. In terms of at least one of these, I locked horns with Sprackland at the ICZN, and ultimately the ICZN sided with me on the matter. That was in relation to his description of a monitor that had been previously named by Wells and Wellington (*Varanus keithhornei*, inadvertently redescribed by Sprackland as *V. teriae*)(ICZN Opinion 1970 (Case 3043) published on 30 March 2001, cited here as ICZN (2001)).

I lost another battle with Sprackland at the same time. This was in terms of a dispute over the species name "*Varanus panoptes*", ruled on by the ICZN a year earlier (see ICZN 2000), although both cases before the ICZN were directly linked to one another, with Sprackland having been the person to petition the ICZN in both and at the same time.

To his credit, Sprackland always played the ball and not the man and both before and after this spat, he has always worked with me in all matters herpetological and never borne a grudge.

He has always seen the bigger picture in terms of things.

However of greater significance is the role he has played in conservation of reptiles and it is for this that he has been honoured here.

One such example is a paper he published in *The Vivarium* (Sprackland 1989), spelling out the sources of live reptile poaching by humans and shattering the myth that hobbyists and keepers are the cause of the declines in species.

Species in *Spracklandus* gen. nov.

Spracklandus ashei (Wüster and Broadley 2007)

Spracklandus nigricincta (Bogert 1940)

Spracklandus nigricollis (Reinhardt 1843)

Spracklandus mossambica (Peters 1854)

Spracklandus pallida (Boulenger 1896)

Spracklandus nubiae (Wüster and Broadley 2003)

Spracklandus katiensis (Angel 1922)

SUMMARY AND END COMMENTS

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

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

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

The division of True Cobras into just four genera is in fact very conservative in terms of modern classification methods and taxonomy.

There were obvious splits at the subgenus level for some groups, which at this stage I have refrained from doing, the main reason being doubts as to the accuracy of time of diversion measurements quoted in the various papers cited herein.

The delineation of the main groups effectively names all major groups based on earliest divergences.

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

Using Wüster et. al. (2007)(fig. 4), the divisions here run at about twenty million years.

More conservatively (and in my view reliably) Kelly, et. al. 2007 still puts the timeline for the split between the groups at well in excess of ten million years (see diagram on page 45).

By any reasonable stretch, this time span allows for differentiation at the genus level.

For the lay person, I can simply compare the current taxonomy and nomenclature of the great apes (defined herein as Humans, Chimpanzees, Gorillas and Orang-utans) and the taxonomy and nomenclature of the rattlesnakes (Hoser 2009c).

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

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

Please note, I do not advocate such a split for these snakes.

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

There are similar positions for other mammals, such as in Elephants, where the Indian and African varieties are placed in different genera, and yet with relatively recent divergences (see Rocca et. al. 2001 and sources cited therein).

REACTIONS TO THE NEW CLASSIFICATION OF TRUE COBRAS

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

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

Some will accept the classification within and use it forthwith and others won't.

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

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

As the differences between groups are not in dispute (except perhaps by so-called "flat earthers"), the only potential for argument is to where one draws the line in terms of defining "genus", and/or at what point a group becomes defined as "monophyletic", which gets to the same argument.

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

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

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

One will be from those opposed to any change and who prefer to use nomenclature they know is wrong

or misleading, but know (as in remember) nonetheless.

For some herpetologists, there is short-term argument this way and this was advanced by Wüster et. al. 2007 and since on internet forums.

However over time this will subside.

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

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

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

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

While arguments with merit are always worthwhile, I can't recall seeing one from any of these people (or their aliases and assumed names they post under), at any stage in the last ten years in terms of claims against my papers and the like.

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

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

In fairness to Wüster, he has already (predating this paper), decided that while acknowledging the paraphyletic nature of the True Cobras, based on a drawing of the line past the 20 million year mark (his own), he has decided to refer all to a single genus (Wüster et. al. 2007).

I do not expect the paper of Kelly et. al. (2009) or this paper to change his view on this.

Furthermore, he is at liberty to push his line further into the past and redefine the group as monophyletic, which is clearly at odds with my own position and based on the same evidence.

Fortunately the ultimate test of science is the truth and not which group of individuals makes the most "noise". In terms of taxonomy and nomenclature the end point should be the result of truth and consistent application.

COBRA AND REPTILE CONSERVATION

While this paper isn't about this topic, it is clear that it is close to my heart as indicated by the names assigned to some taxa and the histories of those persons so honoured.

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

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

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

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

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

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

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

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

In the USA, where until recently individual freedoms were greatly cherished, the same threats to private ownership of reptiles has re-emerged, with both above-named men working hard to white-ant resistance to these new proposed bans on keeping and studying reptiles.

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

The attempts to ban ownership start on species perceived as "dangerous", like Cobras and "killer pythons", as seen in proposals like that currently before the US Federal government.

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

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

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

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

At the present time, few Cobras are regarded as threatened, however as seen with the frogs declining through Chytrid fungus (*Batrachochytrium dendrobatidis*) over the last three decades (Di Rosa, et. al. 2007, Stuart, et. al. 2004), it is entirely possible for common and "secure" species to become rare, endangered or even "extinct" within a few short years.

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

To that end, readers are asked to use common sense and support the right of all sections of the community to have legal and unfettered access to wildlife including Cobra species.

The claims of danger and the like in terms of the

GENUS AND SPECIES LIST FOR THE TRUE COBRAS

Naja

Naja naja (Linnaeus 1758)
Naja kaouthia Lesson 1831
Naja siamensis Laurenti 1768
Naja sputatrix Boie 1827
Naja samarensis Peters 1861
Naja atra Cantor 1842
Naja sumatrana Muller 1890
Naja philippinensis Taylor 1922
Naja mandalayensis Slowinski and Wüster 2000
Naja oxiana (Eichwald 1831)
Naja sagittifera Wall 1913

Boulengerina

Boulengeria annulata (Bucholz and Peters 1876)
Boulengeria christyi Boulenger 1904
Boulengeria multifasciata (Werner 1902)
Boulengeria melanoleuca (Hallowell 1857)

***Wellsus* gen. nov.**

Wellsus haje (Linnaeus 1758)
Wellsus nivea (Linnaeus 1758)
Wellsus annulifera (Peters 1854)
Wellsus anchietae (Bocage 1879)
Wellsus annulifera (Peters 1854)

***Spracklandus* gen. nov.**

Spracklandus ashei (Wüster and Broadley 2007)
Spracklandus nigricincta (Bogert 1940)
Spracklandus nigricollis (Reinhardt 1843)
Spracklandus mossambica (Peters 1854)
Spracklandus pallida (Boulenger 1896)
Spracklandus nubiae (Wüster and Broadley 2003)
Spracklandus katiensis (Angel 1922)

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snakes do not carry weight either.

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

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

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

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

VENOMOID SNAKES

Even more insidious and relevant to conservation of Cobras and other venomous taxa is the concerted campaign against so-called venomoid snakes.

These snakes are devenomized snakes which are made so by the surgical removal of venom glands (see Hoser 2004).

Hence any adverse bite risk to handler is removed.

The operation is virtually painless for the snake and improves the welfare of the snake in that the snake no longer needs to be handled and traumatised with sticks, tongs and other devices.

In spite of these clear advantages, the campaign against them has been based on false and defamatory attacks on myself and anyone else who uses the said snakes (see Hoser 2009a), and a campaign of lies and misinformation to peddle the anti-venomoid view.

False claims include cruelty to the snakes, that snakes regenerate venom (they don't) and the like (see Hoser 2009a and sources cited therein), the sought after position to be an outright ban on possession and use of such snakes.

The obvious safety benefit of venomoids is actually more important than for the keeper of the snake alone.

You see, whenever a reptile keeper is bitten by a dangerous species, such as a Cobra, the forces against conservation raise public alarm over the risks allegedly posed by "deadly snakes" and exaggerate them.

They simultaneously call for a banning on people keeping and breeding and studying them.

The public fear of snakes is already way beyond the actual risks posed.

The inevitable end point is more unnecessary restrictions on the keeping and study and conservation of these reptiles.

In many areas, this means a total ban!

Widespread use of venomoids would avoid the inevitable bite/then hospital/then death incidents, followed by a raft of new laws banning reptiles, as seen in the USA in the period post dating the fatal snakebite of USA-based reptile keeper James Bear in early 2008, bitten by his pet Rattlesnake (*Crotalus horridus*)(Hoser 2009b).

This single incident preceded a raft of anti-snake laws being proposed and passed across the United States and elsewhere, the effects being felt as far away as the already over-regulated Australia (Hoser 2009b).

Venomoids would in effect strip the "anti's" of a major source of ammunition with which to attack the rights of legitimate reptile keepers, scientists and the like.

While I don't advocate all captive elapids being made venomoid, the argument for wider use of these snakes in captivity is compelling, including for example in the area of public demonstrations, where a high percentage of serious snakebites occur (Hoser 2009b).

The anti-conservation forces have in some areas actually managed to get laws passed banning venomoids, which is the thin end of the wedge to totally banning venomous reptiles.

This first step effectively guarantees the next step of the banning reptiles process by ensuring a greater risk of adverse bite of keepers or handlers of these species, which invariably occur.

When the fatal or near fatal bites occur, it can be guaranteed that there will be yet another push to ban ownership or contact with these creatures.

With overpopulation now a potential threat to many species, including perhaps Cobras in the future, the need to maintain taxa in captivity increases in importance.

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

REFERENCES CITED

Boycott, R. C. and Haacke, W. D. 1979. Notes on the type locality, distribution and juvenile colouration of *Naja nigricollis woodi* (Serpentes:Elapidae) and an account of the colour variation in inter-grade populations. *Annals of the Cape Provincial Museums* (Natural History) 13:31-38.

Branch, W. R. 1969. The venomous snakes of Southern Africa. Part 2: Elapidae and Hydrophiidae. *The Snake* 11:199-225.

Branch, W. R. 1988. *Bill Branch's Field guide to the snakes and other reptiles of southern Africa*. New Holland.

Broadley, D.G. 1958. Snakes of Southern Rhodesia. 6. The Egyptian cobra (*Naja haje haje*). *Afr. Wild Life* 12: 125-128.

Broadley, D. G. 1968. A review of the African cobras of the genus *Naja* (Serpentes:Elapinae). *Arnoldia Rhodesia* 3(29):1-14.

Broadley, D. G. 1974. A review of the African cobras of the *Naja nigricollis* complex in southwestern Africa (Serpentes:Elapidae). *Cimbebasia* (Series A)2:155-162.

Broadley, D.G. 1998. The reptilian fauna of the Democratic Republic of the Congo (Congo-Kinshasa). In: Schmidt, K.P. and Noble, G.K., Contributions to the Herpetology of the Belgian Congo... [reprint of the 1919 and 1923 papers]. *SSAR Facsimile reprints in Herpetology*, 780 pp.

Carroll, S.B. 2003. *Genetics and the making of Homo sapiens. Nature 422 (24 April), 849*-857.

Chen, F.C. and Li, W.H. 2001. Genomic divergences between humans and other hominoids and the effective population size of the common ancestor of humans and chimpanzees, *Am J Hum Genet* (Feb) 68(2):444-456.

Deoras, P. J. 1965. *Snakes of India*. National Book Trust, India:156 pp.

Di Rosa, I., et al. 2007. The Proximate Cause of Frog Declines. *Nature* 447.31.

Egan, D. 2007. *Snakes of Arabia*. Motivate Publishing, Dubai, 208 pp.

FitzSimons, V. F. M. 1970. *A field guide to the snakes of southern Africa*. Collins, London, UK. 221 pp.

Fry, B. G., et. al. 2003a. Effectiveness of snake antivenom: Species and regional venom variation and it's clinical impact. *Journ. Toxicol.-Toxin Rev.* 22:23-34.

Fry, B. G. et. al. 2003b. Molecular Evolution and Phylogeny of Elapid Snake Three Finger *Toxins. J. Mol. Evol.* 57:110-129.

Hobolth, A., Christensen, O.F., Mailund, T., Schierup, M.H. 2007. Genomic Relationships and Speciation Times of Human, Chimpanzee, and Gorilla Inferred from a Coalescent Hidden Markov Model. *Plos Genet* 3(2): e7.

Hoser, R. T. 2004. Surgical Removal of Venom Glands in Australian Elapid Snakes: The creation of venomoids. *Herptile* 29 (1)(March):36-52.

Hoser, R.T. 2009a. Creationism and contrived science: A review of python systematics and the resolution of outstanding issues of taxonomy and nomenclature. *Australasian Journal of Herpetology*. 2:1-34.

Hoser, R. T. 2009b. Pain makes venomous snakes bite humans. *Australasian Journal of Herpetology* 5:1-21.

Hoser, R. T. 2009c. A reclassification of the Rattlesnakes; species formerly exclusively placed in the Genera *Crotalus* and *Sistrurus*. *Australasian Journal of Herpetology* 6:1-21.

International Commission on Zoological Nomenclature (ICZN) 1991. Decision of the Commission: Three works by Richard W. Wells and C. Ross Wellington: Proposed suppression for nomenclatural purposes. *Bulletin of Zoological Nomenclature* 48(4):337-338.

International Commission on Zoological Nomenclature (ICZN) 1999. *International Code of Zoological Nomenclature*, (Fourth Edition) International Trust for Zoological Nomenclature, London, UK. (online at: http://www.iczn.org/iczn/index.jsp)

International Commission on Zoological Nomenclature (ICZN) 2000. Opinion 1948 *Hydrosauras gouldi* Gray, 1838 (currently *Varanus gouldii) and Varanus panoptes* Storr, 1980 (Reptilia: Squamata): specific names conserved by the designation of a neotype for *H. gouldii. Bulletin of Zoological Nomenclature* 57(1):63-65.

International Commission on Zoological Nomenclature (ICZN) 2001. Opinion 1970 (Case 3043) *Odatria keithhornei* Wells & Wellington, 1985 (Reptilia, Squamata): specific name placed on the Official List, *Bulletin of Zoological Nomenclature* 58(1).

Joger, U. 1984. *The venomous snakes of the Near and Middle East*, Wiesbaden: 115 pp.

Kelly, C. M. R., et. al. 2009. Phylogeny, biogeography and classification of the snake superfamily Elapoidea: a rapid radiation in the late Eocene. *Cladistics* 25:38-63.

Keogh, J. S. 1998. Molecular phylogeny of elapid snakes and a consideration of their biogeographic history. *Biological Journal of the Linnean Society* 63:177-203.

Nagy, Z. T., et. al. 2005. Molecular systematics of African Colubroidea (Squamata:Serpentes), pp. 221-228 in Huber, B. A. et. al. (eds) *African Biodiversity: Molecules, Organisms, Ecosystems*. Museum Koenig, Bonn, Germany.

Palquerio, M. J. F. and Nichols, R. A. 2006. Dates from the molecular clock: How wrong can we be? *Trends in Ecology and Evolution*, 22(4) 18-184.

Pitman, C. R. S. 1974. *A guide to the snakes of Uganda* (Revised edition). Codicote, Wheldon and Wesley, Ltd. Glasgow, UK:290 pp.

Reitinger, F. F. 1978. *Common Snakes of South east Asia and Hong Kong*. Heinemann, Hong Kong:114 pp. and plates.

Rocca, A. L. et. al. 2001. Genetic Evidence for Two Species of Elephant in Africa. *Science* 24 (August), 293(5534):1473–1477.

Sharma, R. C. 2004. *Handbook Indian Snakes*. Akhil Books, New Delhi, India:292 pp.

Slowinski, J. B. and Keogh, J. S. 2000. Phylogenetic relationships of elapid snakes based on cytochrome *b* mtDNA sequences. *Molecular Phylogenetics and Evolution*, 15:157-164.

Slowinski, J. B. et. al. 1997. Inferring species trees from gene trees: A phylogenetic analysis of the elapidae Elapidae (Serpentes) based on the amino acid sequences of venom proteins. *Molecular Phylogenetics and Evolution*, 8:349-362.

Sprackland, R. G. 1989. Endangered Species and placing blame: what statistics say about the real causes of animal extinction's'. *The Vivarium*, 1 (4):40-44.

Stuart, S. N., et. al. 2004. Status and trends of amphibian declines and extinctions worldwide. *Science* 306:1783-1786.

Stauffer, R.L., Walker, A., Ryder, O.A., Lyons-Weiler, M. and Hedges, S. B. 2001. Human and ape molecular clocks and constraints on paleontological hypothesis. *Journal of Heredity*, 92 (Nov/Dec)6:467-474.

Wells, R.W. and Wellington, C.R. 1983. A synopsis of the class Reptilia in Australia. *Australian Journal of Herpetology*, 1 (3-4):73-129.

Wells, R.W. and Wellington, C.R. 1984. A classification of the Amphibia and Reptilia of Australia. *Australian Journal of Herpetology*, Supplementary Series, (1):1-61.

Whittaker, R. 1978. *Common Indian Snakes*. Macmillan, India:154 pp.

Wüster, W. 2009. Post on internet chat forum at: http://www.venomousreptiles.org/forums/Experts/41892 dated 17 March.

Wüster, W. and Broadley, D. G. 2003. A new species of spitting Cobra from north-eastern Africa (Serpentes:Elapidae). *J. Zool. Lond.* 259:345-359.

Wüster, W. and Broadley, D. G. 2007. Get an eyeful of this: a new species of giant spitting cobra from eastern and north-eastern Africa (Squamata:Serpentes:Elapidea:*Naja*). *Zootaxa* 1532:51-68.

Wüster, W. et. al. 2007. The phylogeny of Cobras inferred from mitochonrial DNA sequences: Evolution of venom spitting and the phylogeny of the African Spitting Cobras (Serpentes: Elapidae: *Naja nigricollis* complex). *Molecular Phylogenetics and Evolution*, 45:437-453.

van der Kooij, J. 2001. The herpetofauna of the Sultanate of Oman: Part 4: The terrestrial snakes. *Podarcis* 2 (2): 54-64

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