

# A long overdue split: Russell's Viper *sensu lato* is formally split six ways (Squamata: Serpentes: Viperidae: *Daboia*)

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## ABSTRACT

In spite of it being one of the so-called "Big Four" snakes of India (Mukherjee 2021) and a well-known component of the south Asian snake fauna, the Russell's Viper *Daboia russelii* (Shaw and Nodder, 1797) from all parts of its range has not in recent years been subject of any taxonomic review.

This is in spite of the fact that morphologically and genetically divergent populations are known and have been so for some years.

Most recent publishing authors currently recognize only one or two species of south Asian *Daboia* Gray, 1842. These are typically just *D. russelii* from east India, west of the Ganges Delta, including nearby Pakistan at the western extremity of the range and *D. siamensis* (Smith, 1917), from extreme east India, east to Taiwan and south to Indonesia.

Other putative species have been formally named but have usually been synonymised since.

Following a review of the group across the known range, this paper recognizes six species, three of which are formally named for the first time in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

In the case of the species *D. siamensis*, three subspecies are also recognized, although it is acknowledged a strong case for species-level recognition of these also exists.

Previously synonymised names are available for each.

The relevant newly named species are each believed to have diverged from their closest related congeners 2-3 MYA.

They also appear to be linked to major drainage systems, which is a correlation not noted by any previous author.

The two main clades of species are formally divided into subgenera, with the new genus *Oxyadaboia* *subgen. nov.* including those species from east of the Indian subcontinent, believed to have diverged from the other species 7-11 MYA.

**Keywords:** Herpetology; taxonomy; snake; nomenclature; Asia; Burma; Myanmar; Cambodia; Russell's Viper; *Daboia*; *russelii*; *siamensis*; *pulchella*; *elegans*; *nordicus*; *triseriartus*; *limitis*; *sublimitis*; *trinoculus*; *formosensis*; new subgenus; *Oxyadaboia*; new species; *crottyi*; *oxyi*; *sloppi*.

## INTRODUCTION

The Russell's Viper (*Daboia russelii* Shaw and Nodder, 1797) is a large dangerous ground-dwelling Viper species from southern Asia.

In spite of it being one of the so-called "Big Four" snakes of India (Mukherjee 2021) and a well-known component of the south Asian snake fauna, the Russell's Viper *Daboia russelii* (Shaw and Nodder, 1797) from all parts of its range has not in recent years been subject of any taxonomic review.

This is in spite of the fact that morphologically and genetically divergent populations are known and have been so for some

years.

Most recent publishing authors currently recognize only one or two species of south Asian *Daboia* Gray, 1842. These are typically just *D. russelii* from east India west of the Ganges Delta, including nearby Pakistan at the western extremity of the range and *D. siamensis* (Smith, 1917), from extreme east India, east to Taiwan and south to Indonesia.

Other putative species have been formally named but have been usually synonymised since.

Thorpe *et al.* (2007) in conjunction with Wolfgang Wüster

published a review of "*Daboia russelii*" which guestimated the divergence of the two main populations (Indian subcontinent and the rest) at 7-11 MYA and accordingly divided the two groups into *D. russelii* for the subcontinent animals and *D. siamensis* for the rest.

Various other forms were synonymised.

This was a significant act because Thorpe *et al.* (2007) also stated that within their published phylogeny, 5 or more groups diverged from one another 2-3 MYA, which would normally be treated as a species-level split.

In the decades since the publication of Thorpe *et al.* (2007), Wüster has attempted to set himself up as the gate-keeper of taxonomy and nomenclature in herpetology and aggressively discouraged anyone from working on taxa he claims "ownership" of, or daring to publish any taxonomy or nomenclature that is different to his.

Via his stooge Peter Uetz, managing a website called "The Reptile Database", Wüster peddles his warped world view of reptile taxonomy to others.

He also does much the same by planting other stooges on editorial boards of journals he seeks to control, even going so far as to try to get his stooge Scott Thomson elected to the International Commission of Zoological Nomenclature (ICZN), although that attempt in 2021 failed.

This position of Wüster trying to exert despotic control over taxonomy and nomenclature in herpetology was formalised in Kaiser (2012a, 2012b), with Kaiser (2012b) actually being a document written by Wüster himself. Better known as Wüster *et al.*, it was then published in a print journal as Kaiser *et al.* (2013) (even though in 2012 in Kaiser (2012a) he has stated he had played no part in writing the document), which after being discredited by Hoser (2013), was rejigged by Kaiser (2013 and 2014a-b), and then when this position became wholly untenable was formally ditched and superseded by Rhodin *et al.* (2015).

After the ICZN formally rejected the claims of Rhodin *et al.* (2015) in the ruling of ICZN (2021) the claim being contested as to cede power to Wüster that would have allowed him alone to usurp the ICZN's authority, the latest incarnation of Wüster's despotic attempt to control herpetological taxonomy and nomenclature is via his latest publication of relevance being Wüster *et al.* (2021).

Wüster *et al.* (2021) is a direct attack on the primacy of the International Commission of Zoological Nomenclature and the *International Code of Zoological Nomenclature* (Ride *et al.* 1999) and ICZN (2012).

The latter document is the rule book for all scientists with respect of nomenclature for zoology, except of course for Wolfgang Wüster and his gang of thieves who are best described as a bunch of crooks, who do occasionally attempt to dabble in science. Wüster has been running his various attacks on legitimate herpetologists for decades, including via his stooges and since at least 1987 (see Shine 1987, Shea 1987 and Sprackland *et al.* 1997).

These activities have been discredited by ICZN (1991, 2001, 2021), Cogger (2014), Dubois (2014), Dubois *et al.* (1988), Hoser (2001a, 2001b, 2007, 2009, 2012a, 2012c, 2013, 2015a-f, 2017, 2019a-b) Hawkeswood (2021) and numerous other scientists.

As a result of the preceding the taxonomy of *Daboia* in south Asia has been effectively on ice for the past 15 years!

Science must progress and with human population and environmental pressures increasing throughout southern Asia, the resolution of the taxonomy and nomenclature of the south Asian *Daboia* now becomes a matter of urgency.

This is particularly in view of significant declines in numbers of all relevant species across the Indian subcontinent, where the

putative species was most common and continued declines in populations elsewhere, which while thought to be extensive, are now known to be severely fragmented.

Hence the formal review of the genus and/or species across the known range.

#### MATERIALS AND METHODS

Notwithstanding the molecular results of Thorpe *et al.* (2007) which flagged a number of putative species, all were revisited as part of this study.

Specimens from across the range of putative *Daboia* in southern Asia were inspected (live, dead and from photos with quality location data), along with a review of the relevant published literature on the putative species, including all notable morphological and molecular studies.

These were also cross-checked with other studies relevant to known sea level minima during times of glacial maxima in the Pliocene-Pleistocene epochs as a means to calibrate measured genetic divergences in the relevant published studies if at all possible and in this case of *Daboia*, to confirm likely distributions and zones of admixture during times of glacial minima and maxima.

Museum holdings were audited with a view to ascertaining accurate and likely distributions across southern Asia, with a view to determining preferred habitats and exclusionary zones likely to facilitate speciation.

Literature relevant to the putative species *D. russelii* including previously synonymised forms and relevant taxonomic decisions made herein include Adil *et al.* (2020), Adler (2015), Adler *et al.* (2000), Avadhani (2005, 2006), Bannermann (1907a, 1907b), Bauer (2015), Bauer *et al.* (2015), Beolens *et al.* (2011), Bhattarai *et al.* (2018, 2020), Bhupathy and Sathishkumar (2013), Botejue *et al.* (2012), Brongersma (1958), Campbell (2015), Campbell and Verveniotou (2015), Chan-ard *et al.* (1999, 2015), Chettri and Chhetry (2013), Cox *et al.* (1998), Das (2012, 2015), Das and De Silva (2005), De Lang (2011a, 2011b, 2017), De Silva (1998), Deshmukh *et al.* (2020), Dowling (1993), Dowling and Jenner (1988), Dutta *et al.* (2009), Fenton (1905), Ganesh *et al.* (2018, 2020), Gayen *et al.* (2019), Glaudas (2021), Habib and Cheda (2010), Hamid (2020), Hoser (2012b, 2022), Ingle (2020), Ingle *et al.* (2019), Iskandar and Mumpuni (2002), Jadhav *et al.* (2018), Janzen *et al.* (2017), Jayakody (2001), Kalki *et al.* (2021), Karthik *et al.* (2018), Karunaratna and Thasun Amarasinghe (2011), Kästle *et al.* (2013), Khan (1983), Khan and Ahmad (2019), Khandakar and Jeny (2020), Kopstein (1936), Lenz (2012), Leviton *et al.* (2003), Madushanka and Ranathunga (2019), Maki (1931), Manhas *et al.* (2016, 2018), Manthey and Grossmann (1997), Masroor (2012), McDiarmid *et al.* (1999), Mertens (1927, 1930, 1957), Mukherjee (2021), Murthy (2010), Narayan Rao (1918), Neang *et al.* (2015), Norval *et al.* (2008), Paira *et al.* (2022), Palot (2015), Pandey (2018), Parmar and Shantilal (2019), Patel and Vyas (2019), Patel *et al.* (2018), Phelps (2010), Purkayastha (2013), Pyron *et al.* (2013), Rawat *et al.* (2020), Sahi and Koul (2020), Saikia *et al.* (2007), Sharma (2004), Sharma *et al.* (2013), Shaw and Nodder (1979), Smith (1917, 1943), Šmíd and Tolley (2019), Taylor (1965), Thakur (2011), Thorpe *et al.* (2007), Toriba (1993), Trivedi and Desai (2019), Tsetan and Ramanibai (2011), Vyas (2007a-b, 2011, 2013), Vyas and Thakur (2015), Wall (1905a, 1905b, 1906, 1907), Wallach *et al.* (2014), Welch (1994), Whittaker and Captain (2004), Winchell (2003a, 2003b), Wirth (2011), Wüster (1998), Wüster *et al.* (1992a, 1992b) and sources cited therein.

#### RESULTS

It turned out that Russell's Vipers preferred habitat includes plains, coastal lowlands, and hills of suitable habitat. Excessively humid environments such as rainforests are

avoided as are deserts, both of which are effective at splitting populations.

To that effect, it was noted that the south Asian populations of *Daboia* formed morphological and genetic groups based on major river valley drainages and associated landforms.

These were as follows:

- 1/ Indus River;
- 2/ Ganges/Brahmaputra drainage, including along the coast and hills of southern India, in particular the eastern Ghats;
- 3/ Irawaddy Basin (Myanmar);
- 4/ Chao Phraya (Thailand),
- 5/ Lower Mekong (Cambodia, Vietnam, east Thailand, Laos),
- 6/ South China Sea/Indonesia

With the first two groups diverging from one another in excess of 3 MYA, they are both herein recognized as full species.

These are within *D. russelii* (Shaw and Nodder, 1797) *sensu stricto*.

The type locality of *D. russelii* is India. Other available synonyms for this form, are *D. nordicus* (Deraniyagala, 1945) from Calcutta, *D. pulchella* Gray, 1842 from Sri Lanka, *D. elegans* (Daudin, 1803) from south-east India and *D. triseriartus* (Hermann, 1804) from Tamil Nadu, India (south India).

None can be applied to the form from the Indus Valley in Pakistan and so that is effectively unnamed.

Therefore it is formally named as *D. crottyi* sp. nov..

Both *D. russelii* and *D. crottyi* sp. nov. as pair are believed to have diverged from the species east of the Indian subcontinent 7-11 MYA (Thorpe et al. 2007). Combined with the obvious morphological and geographic divergence, it is appropriate the eastern clade of species be placed in a separate subgenus. As no name is available, the subgenus *Oxyadaboia* subgen. nov. with a type species of *Daboia* (*Oxyadaboia*) *oxyi* sp. nov. is erected to accommodate these taxa.

In terms of the other six populations of putative *D. russelii* or *D. siamensis* (Smith, 1917), all herein placed in the subgenus *Oxyadaboia* subgen. nov. the oldest potentially available synonym is *Coluber trinoculus* Schneider, 1802, but as it has not been used as correct since being formally synonymised with "*Vipera elegans*" by Merrem in 1820 (at page 153), this priority defers under the *International Code of Zoological Nomenclature* (Ride et al. 1999) to the widely used *D. siamensis* (Smith, 1917), with a type locality of 60 km north of Bangkok, Thailand. This name therefore accounts for the population centred on Chao Phraya, Thailand.

*D. sublimitus* (Kopstein, 1936) has a type locality of Java and so can be applied to the South China Sea/Indonesian population and so is an available name for the taxon.

Other available names for the same putative species (*D. siamensis*) are *D. limitis* (Mertens, 1927) from Endeh Island, an islet offshore from Flores in the Lesser Sundas and *D. formosensis* (Maki, 1931) from Taiwan.

Those two names can be applied to the relevant populations of the same species based on divergence of the forms, the latter including specimens from the nearby mainland of China.

Hence the preceding cluster, with three available names, are treated herein as *D. limitis* (Mertens, 1927) (from the Sunda Islands), being the oldest relevant available name, with the subspecies *D. limitis sublimitis* (Kopstein, 1936) from Java and *D. limitis formosensis* (Maki, 1931) from Taiwan and nearby coastal China.

Notwithstanding this conservative treatment, there is a strong argument for treating each of the trio as separate species.

Each are geographically disjunct, morphologically divergent and evolving as separate species. Furthermore all are likely to have diverged from one another somewhere between 2-3 MYA

*sensu* Thorpe et al. (2007).

A diagnostic separation of the relevant subspecies is done in the formal descriptions below for two relevant associated species, being the first such formal separation of the relevant forms in a peer reviewed scientific paper.

In terms of these morphologically and genetically similar snakes, spread across a wide geographical area and in the absence of obvious drainage basin, it was noted that in recent geological times the Sunda shelf occupied much of west Indonesia and the nearby South China sea, creating a relatively optimal corridor of habitat for transit of snakes across.

At times of ice-age maxima the local climate would have been considerably drier than seen at present enabling the putative species to move through areas now considered too moist for them to do so.

Having said this, each of the three main groups within this putative species (*D. siamensis*), are at least sufficiently divergent to warrant recognition as subspecies as is done here.

This leaves both the Irawaddy Basin (Myanmar) and lower Mekong (Cambodia, Vietnam, east Thailand, Laos) populations unnamed and without available names. As they are significantly divergent from all others, including being more divergent from all other forms than the above-named subspecies are from one another, these two populations are formally named as *B. oxyi* sp. nov. and *B. sloppi* sp. nov..

Hence in this paper there is in total, a new subgenus and three new species being formally named for the first time in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride et al. 1999).

#### NOTES ON THE FORMAL DESCRIPTIONS THAT FOLLOW

In terms of the descriptions that follow, the following should be noted:

There is no conflict of interest in terms of this paper or the conclusions arrived at herein.

Several people including anonymous peer reviewers who revised the manuscript prior to publication are also thanked as are relevant staff at museums who made specimens and records available in line with international obligations.

In terms of the following formal descriptions, spellings should not be altered in any way for any purpose unless expressly and exclusively called for by the rules governing Zoological Nomenclature as administered by the International Commission of Zoological Nomenclature (ICZN).

This includes if gender assignment of suffixes seems incorrect, Latinisation is wrong, apparent spelling mistakes and so on (see Article 32.5.1 of the Code).

In the unlikely event two or more newly named taxa are deemed to be the same by a first reviser, then the name to be used and retained is that which first appears in this paper by way of page priority and as listed in the abstract keywords.

Some material in descriptions for taxa may be repeated for other taxa in this paper and this is necessary to ensure each fully complies with the provisions of the *International Code of Zoological Nomenclature* (fourth edition) (Ride et al. 1999) as amended online since (ICZN 2012).

Material downloaded from the internet and cited anywhere in this paper was downloaded and checked most recently as of 10 June 2022 (including if also viewed prior), unless otherwise stated and was accurate in terms of the content cited herein as of that date. Any online citations within this paper, including copied emails and the like, are not necessarily cited in the references part of this paper and have the same most recent viewing date as just given.

Unless otherwise stated explicitly, colour and other descriptions apply to living and **fully mature adult specimens** of generally good health, as seen by day, and not under any form of stress by means such as excessive cool, heat, dehydration, excessive ageing, abnormal skin or reaction to chemical or other input.

SVL or SV means snout-vent length, TL means tail length.

While numerous texts and references were consulted prior to publication of this paper, the criteria used to separate the relevant genera, subgenera, species or subspecies has already been spelt out and/or is done so within each formal description and does not rely on material within publications not explicitly cited herein.

**OXYADABOIA SUBGEN. NOV.**

**LSIDurn:lsid:zoobank.org:act:4C60DB92-F854-4D24-A07C-050181BA133E**

**Type species:** *Daboia oxyi* sp. nov. (AKA *Daboia* (*Oxyadaboia*) *oxyi* sp. nov.).

**Diagnosis:** Snakes in the nominate genus *Daboia* Gray, 1842 occur in the Indian subcontinent region. Snakes in the subgenus *Oxyadaboia subgen. nov.* occur in south-east Asia from far east India and Burma in the west, to Taiwan in the east and south to the Lesser Sundas, Indonesia. The distribution within this range is however patchy and appears to be associated with major drainage basins and lowland regions. The south-east Asian *Daboia* being the subgenus *Oxyadaboia subgen. nov.* are separated from *D. crottyi* sp. nov. and *D. russelii* (being the entirety of the type subgenus *Daboia* Gray, 1842), by dorsal colouration, which incorporates large dark dorsal squares or circles of irregular shape along the mid dorsal line combined with medium sized lateral squares with rounded and irregular edges and shape, while between the two are small but obvious dark triangles and other irregular shapes tending to form an additional row.

By contrast *D. crottyi* sp. nov. and *D. russelii* (being the entirety of the type subgenus *Daboia* Gray, 1842), are defined by very large dorsal circles or squares of irregular shape with large light coloured centres and similar but slightly smaller shapes of similar form on the lateral line (or flanks). There are no obvious dark triangles and other irregular shapes tending to form an additional row between these rows of larger markings.

Thorpe *et al.* (2007) in their account of the relevant species inadvertently reversed the correct species for the preceding characters in their Fig. 3. on page 214.

All south Asian *Daboia*, being the entirety of the genus *Daboia* Gray, 1842 as defined by Hoser (2012), are separated from all other vipers by the following suite of characters:

No sensory pit between nostril and eye; head very distinct from neck, above covered by small, keeled, imbricate scales, 6-9 between narrow supraoculars; nostril large, in large nasal shield which, below, is fused to the rostral; eye, with vertically elliptic pupil, surrounded by 10-15 small scales, 3-4 rows of small scales separating the circumocular scales from the upper labials; temporals small; 10-12 upper labials; 27-33 longitudinal rows of scales at midbody, all except outmost row strongly keeled; ventrals 153-180; subcaudals 41-64, all paired; colour above light brown with 3 longitudinal series of large black-margined brown spots or blotches, the vertebral series often merging to form a chain-like longitudinal stripe; in all species except *D. russelii* and *D. crottyi* sp. nov. there is an additional longitudinal series of small dark spots between the main vertebral and lateral series; yellowish white below occasionally with dark brown markings (modified from Leviton *et al.* 2003).

*Daboia* is separated from the closely related genus *Maxhoservipera* Hoser, 2012 by the less thick-set build of *Daboia* species and the fact that the dark blotch running into

the eye is considerably wider than the eye, as opposed to being roughly the same width. *Daboia* species are further separated by the dorsal pattern which is not in the zig-zag configuration seen in the genus *Maxhoservipera*.

The pattern in *Daboia* is a colour pattern consisting of a deep yellow, tan or brown ground colour, with three series of dark edged spots that run the length of the body on the mid-line and each of the flanks. Each of these spots has a black or dark brown ring around it, the outer border of which is sometimes intensified with a rim of white or yellow, but giving an impression of ovals, smooth circles or similar as opposed to the more typical viperine zig-zag or chain pattern. The dorsal spots, which usually number 23-30, may grow together, while the side spots may break apart (modified from Hoser, 2012).

**Distribution:** *Oxyadaboia subgen. nov.* occur in south-east Asia from far east India and Burma in the west, to Taiwan in the east and south to the Lesser Sundas, Indonesia. The distribution within this range is however patchy and appears to be associated with major drainage basins and lowland regions.

**Etymology:** As for the species *Daboia oxyi* sp. nov.. The spelling name for this subgenus should not be altered. The spelling is deliberate and it is a take on Australian slang as well.

**Content:** *Daboia* (*Oxyadaboia*) *oxyi* sp. nov. (type species); *D. (Oxyadaboia) limitis* (Mertens, 1927); *D. (Oxyadaboia) siamensis* (Smith, 1917); *D. (Oxyadaboia) sloppi* sp. nov..

**Note:** *D. (Oxyadaboia) limitis* includes the three subspecies *D. limitis limitis* (Mertens, 1927) from the Sunda Islands, Indonesia; *D. limitis formosensis* (Maki, 1931) from Taiwan and nearby China and *D. limitis sublimitis* (Kopstein, 1936) from Java, Indonesia.

**DABOIA (DABOIA) CROTTYI SP. NOV.**

**LSIDurn:lsid:zoobank.org:act:6657305F-0550-4BAC-BBE9-DCFB66CABA7E**

**Holotype:** A preserved specimen in the Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, USA, specimen number CM Herps 69426 collected from Pindi Bhattan, Jhangh District, Pakistan.

This facility allows access to its holdings.

**Paratype:** A preserved specimen in the Museum of Vertebrate Zoology, University of California, Berkeley, California, USA, specimen number MVZ:Herp:248468 collected from Buddh Village, Sujawal, Thatta District, Sindh Province, Pakistan, Latitude 24.605307 N., Longitude 68.077217 E.

**Diagnosis:** *Daboia crottyi* sp. nov. has until now been treated as a western population of *D. russelii* (Shaw and Nodder, 1797).

*Daboia crottyi* sp. nov. has a distribution centred on the Indus Valley in Pakistan, but including relevant parts of north-west India.

*D. russelii* (Shaw and Nodder, 1797) is found in most parts of India, including the Ganges Brahmaputra drainage, southern India and also nearby low-elevation parts of Nepal.

The south Asian *Daboia* from further east, or south-east Asia being the subgenus *Oxyadaboia subgen. nov.* are separated from *D. crottyi* sp. nov. and *D. russelii* by dorsal colouration, which incorporates large dark dorsal squares or circles of irregular shape along the mid dorsal line combined with medium sized lateral squares with rounded and irregular edges and shape, while between the two are small but obvious dark triangles and other irregular shapes tending to form an additional row.

By contrast *D. crottyi* sp. nov. and *D. russelii* (being the entirety of the type subgenus *Daboia* Gray, 1842), are defined by very large dorsal circles or squares of irregular shape with

large light coloured centres (more-or-less along the mid-dorsal axis) and similar but slightly smaller shapes of similar form on the lateral line (or flanks). There are no obvious dark triangles and other irregular shapes tending to form an additional row between these rows of larger markings.

Thorpe *et al.* (2007) in their account of the relevant species inadvertently reversed the correct species for the preceding characters in their Fig. 3. on page 214.

*D. russelii* is readily separated from *D. crottyi* sp. nov. by having dark circles or similar of irregular shape along the mid-dorsal line that are boldly edged with black with the inner and outer edge being well-defined. The inner part of these shapes is light brown.

By contrast in *D. crottyi* sp. nov. the same blotches are edged with dark brown (rather than black) and the inner edge is either poorly defined or of similar colour to the adjoining part of the inside of the blotch, which is also a dark to medium brown colour.

In *D. crottyi* sp. nov. the interspaces between the blotches on the dorsum are brownish, rather than yellowish as seen in *D. russelii*.

In effect the preceding two trait differences means that *D. russelii* is a boldly coloured snake, whereas *D. crottyi* sp. nov. is not.

All south Asian *Daboia*, (both subgenera) being the entirety of the genus as defined by Hoser (2012), are separated from all other vipers by the following suite of characters:

No sensory pit between nostril and eye; head very distinct from neck, above covered by small, keeled, imbricate scales, 6-9 between narrow supraoculars; nostril large, in large nasal shield which, below, is fused to the rostral; eye, with vertically elliptic pupil, surrounded by 10-15 small scales, 3-4 rows of small scales separating the circumocular scales from the upper labials; temporals small; 10-12 upper labials; 27-33 longitudinal rows of scales at midbody, all except outermost row strongly keeled; ventrals 153-180; subcaudals 41-64, all paired; colour above light brown with 3 longitudinal series of large black-margined brown spots or blotches, the vertebral series often merging to form a chain-like longitudinal stripe; in all species except *D. russelii* and *D. crottyi* sp. nov. there is an additional longitudinal series of small dark spots or markings between the main vertebral and lateral series; yellowish white below occasionally with dark brown markings (modified from Leviton *et al.* 2003).

*Daboia* is separated from the closely related genus *Maxhoservipera* Hoser, 2012 by the less thick-set build of *Daboia* species, with *Maxhoservipera* being very stout in build and the fact that the dark blotch running into the eye is considerably wider than the eye, as opposed to being roughly the same width.

*Daboia* species are further separated by the dorsal pattern which is not in the obvious zig-zag configuration seen in the genus *Maxhoservipera*.

The pattern in *Daboia* is a colour pattern consisting of a deep yellow, tan or brown ground colour, with three series of dark edged spots that run the length of the body on the mid-line and each of the flanks. Each of these spots has a black or dark brown ring around it, the outer border of which is sometimes intensified with a rim of white or yellow, but giving an impression of ovals, smooth circles or similar as opposed to the more typical viperine zig-zag or chain pattern. The dorsal spots, which usually number 23-30, may grow together, while the side spots may break apart (modified from Hoser, 2012).

*D. crottyi* sp. nov. is depicted in life online at:

<https://www.inaturalist.org/observations/35578010>

and

<https://www.inaturalist.org/observations/34441219>

and

<https://www.flickr.com/photos/wildhiss/2884851637/>

*D. russelii* in life is depicted online at:

<https://www.inaturalist.org/observations/78201336>

and

<https://www.inaturalist.org/observations/36666824>

and

<https://www.inaturalist.org/observations/113401995>

and

<https://www.inaturalist.org/observations/71944667>

and

<https://www.inaturalist.org/observations/99969057>

and

<https://www.flickr.com/photos/wildlifer-india/5869356818/>

**Distribution:** *Daboia crottyi* sp. nov. has a distribution centred on the Indus Valley in Pakistan, extending in the north to Punjab and nearby in north-west India.

**Etymology:** *Daboia crottyi* sp. nov. was named in honour of a Great Dane cross Rottweiler Dog, named *Crotalus* or "Crotty" for short, in recognition of the 13 years of service he gave guarding our wildlife research facility in Australia. The name was also chosen as a species name as it is short, simple and easy to remember.

**DABOIA (OXYADABOIA) OXYI SP. NOV.**

**LSIDurn:lsid:zoobank.org:act:A8BD1BC2-3732-45A0-8DFB-ABA28882DB5B**

**Holotype:** A preserved adult male specimen at the California Academy of Sciences, San Francisco, California, USA, specimen number CAS HERP 210835 collected from Kyaukpadaung Township, near Myauk Taw Village, Mandalay Division, Myanmar (Burma), Latitude 21.00112 N., Longitude 95.14500 E.

This facility allows access to its holdings.

**Paratypes:** 1/ A preserved male specimen at the California Academy of Sciences, San Francisco, California, USA, specimen number CAS HERP 206671 caught crossing the road near Monywa, Sagaing Division, Myanmar (Burma) Latitude 22.21824 N., Longitude 95.34128 E. 2/ A preserved specimen in the California Academy of Sciences, San Francisco, California, USA, specimen number CAS HERP 205255 collected from farm fields on the east side of the road about 1 km from the road, being the Mandalay-Yangon Road, 96 km south of Mandalay, Mandalay Division, Myanmar (Burma), Latitude 21.19475 N., Longitude 96.04231 E. 3/ A preserved juvenile specimen at the California Academy of Sciences, San Francisco, California, USA, specimen number CAS HERP 216112 collected from Na Htoe Gyi Township, Minsontaung Wildlife Sanctuary, Mya Taung Village, Mandalay Division, Myanmar (Burma), Latitude 21.22586 N. Longitude 95.47599 E.

**Diagnosis:** *Daboia (Oxyadaboia) oxyi* sp. nov. has until now been treated as a population of either, *D. russelii* (Shaw and Nodder, 1797) with a type locality of India or more recently as a population of *D. siamensis* (Smith, 1917), with a type locality of 60 km north of Bangkok, Thailand.

While more closely related to the latter species, *D. oxyi* sp. nov. is sufficiently divergent to be treated as a separate species.

*D. siamensis* (Smith, 1917) from central Thailand, *D. oxyi* sp. nov. from the Irawaddy Basin Myanmar (Burma), *D. sloppi* sp. nov. from the lower Mekong basin (Cambodia, Vietnam, northern Thailand and Laos) and *D. limitis* (Mertens, 1927) from southern Indonesia (2 subspecies recognized herein from here) and southern China/Taiwan (another third subspecies recognized from here), being the entirety of the subgenus

*Oxydaboia subgen. nov.* are all separated from the nominate subgenus of *Daboia* Gray, 1842, being *D. russelii* from India/ Nepal and the closely related *D. crottyi sp. nov.* from the Indus Valley, Pakistan and nearby north-west India by dorsal colouration, which incorporates large dark dorsal squares or circles of irregular shape along the mid dorsal line combined with medium sized lateral squares with rounded and irregular edges and shape, while between the two are small but obvious dark triangles and other irregular shapes tending to form an additional row.

By contrast *D. crottyi sp. nov.* and *D. russelii* are defined by very large mid-dorsal circles or squares of irregular shape with large light coloured centres and similar but slightly smaller shapes of similar form on the lateral line (or flanks). There are no obvious dark triangles and other irregular shapes tending to form an additional row between these rows of larger markings.

By contrast *D. crottyi sp. nov.* and *D. russelii* are defined by very large mid-dorsal circles or squares of irregular shape with large light coloured centres and similar but slightly smaller shapes of similar form on the lateral line (or flanks). There are no obvious dark triangles and other irregular shapes tending to form an additional row between these rows of larger markings. Thorpe *et al.* (2007) in their account of the relevant species inadvertently reversed the correct species for the preceding characters in their Fig. 3. on page 214.

Species and subspecies within the subgenus *Oxydaboia subgen. nov.* are separated from one another by the following unique suites of characters:

*Daboia oxyi sp. nov.* from the Irawaddy Basin (Myanmar) is by far the most divergent of the species within the subgenus *Oxydaboia gen. nov.*, both by morphology and genetic divergence. It is separated from all other species in this subgenus by having a dorsum consisting of extremely large dark brown blotches along the mid-dorsal line and similarly large ones on the flanks. These blotches are blackish at the outer edges, but the majority of each blotch is an even dark brown. The third intermediate row of blotches between the main rows consists of mainly rounded edged triangles.

In combination the dark blotches effectively fill the dorsum and flanks so that the lighter interspaces, a light grey in this species, are reduced to form well-defined light grey lines separating the dark, being in the form of a reticulum, this being unique to this species. On the dorsum the large blotches commonly join to form a single shape along the spinal region, sometimes with a break and sometimes not. The dark spots on the flanks are so expanded that they tend to run into the ventral surface.

The tail has dark brown on top and is marked grey on the flanks.

*Daboia siamensis* (Smith, 1917) from the Chao Phraya region of central Thailand is very different to *D. oxyi sp. nov.* *D. siamensis* has blotches on the dorsum and flanks (the three main rows), being in the form of large circles of reduced size, with the interspaces being wide and a beige to yellow-brown colour. The smaller spots between the main rows are in the form of broken lines that are blackish-brown in colour. While in *D. oxyi sp. nov.* the dark blotches on the dorsum and flanks are the overwhelming bulk of the surface area, in *D. siamensis* this is not the case. The light interspaces are about half or even more than half of the surface area.

The dark circles on *D. siamensis* are a bright orange or orange-brown in colour, becoming dark brown to black on the extreme outer edges. The tail is mainly dark brown on top and marked light brown to beige on the flanks.

*D. sloppi sp. nov.* from the lower Mekong drainage of Cambodia and adjacent countries, being Myanmar, Laos and Thailand is similar in most respects to *D. siamensis* as

described above, but is separated from that species by having a reduced number of spots running along the dorsum and flanks, but of increased size, the result being that about half the body is still lighter interspace, this being a medium brown colour. Both the large blotches on the dorsum and the flanks are distinctively jagged edged as are the smaller blotches on the upper flank region. Tail is mainly light brown with some dark brown markings, mainly on the uppermost surfaces.

The smaller blotches on the flanks are also more numerous and these are prominent along much of the flank between larger blotches, versus not prominent or common on the flanks between larger blotches in *D. siamensis*, or otherwise absent along much of the flank.

Diagnostic for all three subspecies of *D. limitis* (Mertens, 1927), is that in terms of the larger spots on the dorsum and flanks, there is either no darkening, or no obvious darkening of the outer edges, as seen in all other species in this subgenus, namely *D. siamensis*, *D. sloppi sp. nov.* and *D. crottyi sp. nov.* *D. limitis limitis* of the type form from the Lesser Sundas, Indonesia are readily separated from the other subspecies by having a light grey dorsum which in turn has rows of odd-shaped dark grey to grey-brown blotches on the dorsum and flanks. The smaller spots or markings in between these larger spots are somewhat indistinct. Half or most of the dorsum is lighter interspaces and the larger spots on the flanks are still small as compared to other species and subspecies and fall way short of the ventral surface. White on the outer edges of the dorsal blotches is either absent or very minimal and barely noticeable.

*D. limitis sublimitis* (Kopstein, 1936) from Java is separated from the type form of *D. limitis limitis* and *D. limitis formosensis* (Maki, 1931) by being a light reddish-brown colour above, with chocolate brown blotches on the dorsum and flanks, these having a strong whitish etching on the outer edges. The tail is a light reddish brown with chocolate brown markings, mainly on the dorso-medial ridge.

*D. limitis formosensis* is separated from the other two subspecies of *D. limitis* by having a medium-grey dorsum overlain with dark grey blotches on the median line and on the flanks. Those blotches have an obvious thin white line etching each of them. The blotches on the dorsum and flanks are in the main consisting of well formed and evenly shaped ovals. In combination these blotches occupy most of the dorsum, (but not to the extent seen in *D. oxyi*), meaning that *D. limitis formosensis* is unique in the complex in having the overall appearance of being a dark, grey coloured snake. Circles on the lower flanks either approach or touch the boundary of the ventral surface. Tail is grey, with dark grey marking on the upper surface.

*Daboia (Oxydaboia) oxyi sp. nov.* is depicted in life online at: <https://www.flickr.com/photos/65586506@N04/27590045129/> and

<https://www.flickr.com/photos/65586506@N04/25497852268/>

*D. (Oxydaboia) siamensis* is depicted in life online at: <https://www.inaturalist.org/observations/105656167>

and

<https://www.inaturalist.org/observations/106157355>

and

<https://www.inaturalist.org/observations/14563329>

*D. (Oxydaboia) sloppi sp. nov.* is depicted in life in Fig. 8 on page 178 of Neang *et al.* (2015).

*D. (Oxydaboia) limitis limitis* is depicted in life in De Lang (2011b) on pages 261, 262, 264-267 and online at:

<https://www.inaturalist.org/observations/73293923>

and

<https://www.inaturalist.org/observations/35630271>

and  
<https://www.inaturalist.org/observations/44841835>  
 and  
<https://www.flickr.com/photos/96574168@N02/27547836234/>  
 and  
<https://www.flickr.com/photos/hamidtun/50500544097/>  
 and  
<https://www.flickr.com/photos/96574168@N02/24217001436/>  
*D. (Oxyadaboia) limitis formosensis* is depicted in life online at:  
<https://www.inaturalist.org/observations/98589105>  
 and  
<https://www.inaturalist.org/observations/22192926>  
 and  
<https://www.inaturalist.org/observations/78564111>  
 and  
<https://www.inaturalist.org/observations/109822621>  
 and  
<https://www.flickr.com/photos/bobhawley/24487294678/>  
*D. (Oxyadaboia) limitis sublimitis* is depicted in life online at:  
[https://www.flickr.com/photos/gazs\\_pics/17840504359/](https://www.flickr.com/photos/gazs_pics/17840504359/)  
*D. russelii* is readily separated from *D. crottyi sp. nov.* by having dark circles or similar of irregular shape along the mid-dorsal line that are boldly edged with black with both the inner and outer edge being well-defined. The inner part of these shapes is light brown.  
 By contrast in *D. crottyi sp. nov.* the same blotches are edged with dark brown (rather than black) and the inner edge is either poorly defined or of similar colour to the adjoining part of the inside of the blotch, which is also a dark to medium brown colour.

In *D. crottyi sp. nov.* the interspaces between the blotches on the dorsum are brownish, rather than yellowish as seen in *D. russelii*.

In effect the preceding two trait differences means that *D. russelii* is a boldly coloured snake, whereas *D. crottyi sp. nov.* is not.

All south Asian *Daboia*, (both subgenera) being the entirety of the genus as defined by Hoser (2012), are separated from all other vipers by the following suite of characters:

No sensory pit between nostril and eye; head very distinct from neck, above covered by small, keeled, imbricate scales, 6-9 between narrow supraoculars; nostril large, in large nasal shield which, below, is fused to the rostral; eye, with vertically elliptical pupil, surrounded by 10-15 small scales, 3-4 rows of small scales separating the circumocular scales from the upper labials; temporals small; 10-12 upper labials; 27-33 longitudinal rows of scales at midbody, all except outmost row strongly keeled; ventrals 153-180; subcaudals 41-64, all paired; colour above light brown with 3 longitudinal series of large black-margined brown spots or blotches, the vertebral series often merging to form a chain-like longitudinal stripe; in all species except *D. russelii* and *D. crottyi sp. nov.* there is an additional longitudinal series of small dark spots between the main vertebral and lateral series; yellowish white below occasionally with dark brown markings (modified from Leviton *et al.* 2003).

*Daboia* is separated from the closely related genus *Maxhoservipera* Hoser, 2012 by the less thick-set build of *Daboia* species, with *Maxhoservipera* being very stout and the fact that the dark blotch running into the eye is considerably wider than the eye, as opposed to being roughly the same width.

*Daboia* species are further separated by the dorsal pattern which is not in the zig-zag configuration seen in the genus *Maxhoservipera*.

The pattern in *Daboia* is a colour pattern consisting of a deep yellow, tan or brown ground colour, with three series of dark edged spots that run the length of the body on the mid-line and flanks. Each of these spots has a black or dark brown ring around it, the outer border of which is sometimes intensified with a rim of white or yellow, but giving an impression of ovals, smooth circles or similar as opposed to the more typical viperine zig-zag or chain pattern. The dorsal spots, which usually number 23-30, may grow together, while the side spots may break apart (modified from Hoser, 2012).

*D. (Daboia) crottyi sp. nov.* is depicted in life online at:  
<https://www.inaturalist.org/observations/35578010>

and  
<https://www.inaturalist.org/observations/34441219>

*D. (Daboia) russelii* in life is depicted online at:  
<https://www.inaturalist.org/observations/78201336>

and  
<https://www.inaturalist.org/observations/36666824>

and  
<https://www.inaturalist.org/observations/113401995>

and  
<https://www.inaturalist.org/observations/71944667>

and  
<https://www.inaturalist.org/observations/99969057>

Thorpe *et al.* (2007) found a 2-3 MYA divergence between what is herein treated as *D. oxyi sp. nov.* and its nearest congener.

**Distribution:** *D. oxyi sp. nov.* appears to be confined to the Irawaddy Basin Myanmar (Burma).

**Etymology:** *Daboia (Oxyadaboia) oxyi sp. nov.* (both subgenus and species) were named in honour of a Great Dane Dog, named *Oxyuranus* or "Oxy" for short, in recognition of the 8 years of service he gave guarding our wildlife research facility in Australia. The name was also chosen as a species name as it is short, simple and easy to remember.

**DABOIA (OXYADABOIA) SLOPPI SP. NOV.**

**LSIDurn:lsid:zoobank.org:act:9C56F61C-F269-4B7A-8E82-066694EC6562**

**Holotype:** An adult specimen depicted in an image in Fig 8 on page 178 in Neang *et al.* (2015) (missing head and tail), being Neang, T., Grismer, L. L., Hun, S. and Phan, C. 2015. New herpetofauna records and range extensions for *Daboia siamensis* (Smith, 1917) and *Gekko petricolus* Taylor, 1962 from Cambodia. *Cambodian Journal of Natural History* 2015(2)172-182.

The holotype was killed at Tropeang Tung Village, Samroang District, Bansay Reak Commune, Oddar Meanchey Province, Cambodia, Latitude 14.13136 N., Longitude 103.35239 E.

**Diagnosis:** *Daboia (Oxyadaboia) sloppi sp. nov.* has until now been treated as a population of either, *D. (Daboia) russelii* (Shaw and Nodder, 1797) with a type locality of India or more recently a population of *D. (Oxyadaboia) siamensis* (Smith, 1917), with a type locality of 60 km north of Bangkok, Thailand.

While more closely related to the latter species, *D. (Oxyadaboia) sloppi sp. nov.* is sufficiently divergent to be treated as a separate species.

*D. (Oxyadaboia) siamensis* (Smith, 1917) from central Thailand, *D. (Oxyadaboia) sloppi sp. nov.* from the lower Mekong basin (Cambodia, Vietnam, northern Thailand and Laos), *D. (Oxyadaboia) oxyi sp. nov.* from the Irawaddy Basin Myanmar (Burma) and *D. (Oxyadaboia) limitis* (Mertens, 1927) from southern Indonesia (2 subspecies recognized herein from here) and southern China/Taiwan (another third subspecies recognized from here), being the entirety of the subgenus *Oxyadaboia subgen. nov.* are all separated from the nominate subgenus of *Daboia* Gray, 1842, being *D. russelii* from India/

Nepal and the closely related *D. crottyi* sp. nov. from the Indus Valley, Pakistan and nearby north-west India by dorsal colouration, which incorporates large dark dorsal squares or circles of irregular shape along the mid dorsal line combined with medium sized lateral squares with rounded and irregular edges and shape, while between the two are small but obvious dark triangles and other irregular shapes tending to form an additional row.

By contrast *D. crottyi* sp. nov. and *D. russelii* are defined by very large dorsal circles or squares of irregular shape with large light coloured centres and similar but slightly smaller shapes of similar form on the lateral line (or flanks). There are no obvious dark triangles and other irregular shapes tending to form an additional row between these rows of larger markings. Thorpe *et al.* (2007) in their account of the relevant species inadvertently reversed the correct species for the preceding characters in their Fig. 3. on page 214.

Species and subspecies within the subgenus *Oxyadaboia* subgen. nov. are separated from one another by the following unique suites of characters:

*Daboia oxyi* sp. nov. from the Irawaddy Basin (Myanmar) is by far the most divergent of the species within the subgenus *Oxyadaboia* gen. nov., both by morphology and genetic divergence. It is separated from all other species in this subgenus by having a dorsum consisting of extremely large dark brown blotches along the mid-dorsal line and similarly large ones on the flanks. These blotches are blackish at the outer edges, but the majority of each blotch is an even dark brown. The third intermediate row of blotches between the main rows consists of mainly rounded edged triangles.

In combination the dark blotches effectively fill the dorsum and flanks so that the lighter interspaces, a light grey in this species, are reduced to form well-defined light grey lines separating the dark, being in the form of a reticulum, this being unique to this species. On the dorsum the large blotches commonly join to form a single shape along the spinal region, sometimes with a break and sometimes not. The dark spots on the flanks are so expanded that they tend to run into the ventral surface.

The tail has dark brown on top and is marked grey on the flanks.

*Daboia siamensis* (Smith, 1917) from the Chao Phraya region of central Thailand is very different to *D. oxyi* sp. nov.. *D. siamensis* has blotches on the dorsum and flanks (the three main rows), being in the form of large circles of reduced size, with the interspaces being wide and a beige to yellow-brown colour. The smaller spots between the main rows are in the form of broken lines that are blackish-brown in colour. While in *D. oxyi* sp. nov. the dark blotches on the dorsum and flanks are the overwhelming bulk of the surface area, in *D. siamensis* this is not the case. The light interspaces are about half or even more than half of the surface area.

The dark circles on *D. siamensis* are a bright orange or orange-brown in colour, becoming dark brown to black on the extreme outer edges. The tail is mainly dark brown on top and marked light brown to beige on the flanks.

*D. sloppi* sp. nov. from the lower Mekong drainage of Cambodia and adjacent countries, being Myanmar, Laos and Thailand is similar in most respects to *D. siamensis* as described above, but is separated from that species by having a reduced number of spots running along the dorsum and flanks, but of increased size, the result being that about half the body is still lighter interspace, this being a medium brown colour. Both the large blotches on the dorsum and the flanks are distinctively jagged edged as are the smaller blotches on the upper flank region. Tail is mainly light brown with some dark brown markings, mainly on the uppermost surfaces.

The smaller blotches on the flanks are also more numerous and these are prominent along much of the flank between larger blotches, versus not prominent or common on the flanks between larger blotches in *D. siamensis*, or otherwise absent along much of the flank.

Diagnostic for all three subspecies of *D. limitis* (Mertens, 1927), is that in terms of the larger spots on the dorsum and flanks, there is either no darkening, or no obvious darkening of the outer edges, as seen in all other species in this subgenus, namely *D. siamensis*, *D. sloppi* sp. nov. and *D. crottyi* sp. nov.. *D. limitis limitis* of the type form from the Lesser Sundas, Indonesia are readily separated from the other subspecies by having a light grey dorsum which in turn has rows of odd-shaped dark grey to grey-brown blotches on the dorsum and flanks. The smaller spots or markings in between these larger spots are somewhat indistinct. Half or most of the dorsum is lighter interspaces and the larger spots on the flanks are still small as compared to other species and fall way short of the ventral surface. White on the outer edges of the dorsal blotches is either absent or very minimal and barely noticeable.

*D. limitis sublimitis* (Kopstein, 1936) from Java is separated from the type form of *D. limitis limitis* and *D. limitis formosensis* (Maki, 1931) by being a light reddish-brown colour above, with chocolate brown blotches on the dorsum and flanks, these having a strong whitish etching on the outer edges.

The tail is a light reddish brown with chocolate brown markings, mainly on the dorso-medial ridge.

*D. limitis formosensis* is separated from the other two subspecies of *D. limitis* by having a medium-grey dorsum overlain with dark grey blotches on the median line and on the flanks. Those blotches have an obvious thin white line etching each of them. The blotches on the dorsum and flanks are in the main consisting of well formed and evenly shaped ovals. In combination these blotches occupy most of the dorsum, (but not to the extent seen in *D. oxyi*), meaning that *D. limitis formosensis* is unique in the complex in having the overall appearance of being a dark, grey coloured snake. Circles on the lower flanks either approach or touch the boundary of the ventral surface. Tail is grey, with dark grey marking on the upper surface.

*Daboia (Oxyadaboia) oxyi* sp. nov. is depicted in life online at: <https://www.flickr.com/photos/65586506@N04/27590045129/> and

<https://www.flickr.com/photos/65586506@N04/25497852268/>

*D. siamensis* is depicted in life online at:

<https://www.inaturalist.org/observations/105656167>

and

<https://www.inaturalist.org/observations/106157355>

and

<https://www.inaturalist.org/observations/14563329>

*D. sloppi* sp. nov. is depicted in life in Fig. 8 on page 178 of Neang *et al.* (2015).

*D. limitis limitis* is depicted in life in De Lang (2011b) on pages 261, 262, 264-267 and online at:

<https://www.inaturalist.org/observations/73293923>

and

<https://www.inaturalist.org/observations/35630271>

and

<https://www.flickr.com/photos/96574168@N02/27547836234/>

and

<https://www.flickr.com/photos/hamidun/50500544097/>

and

<https://www.flickr.com/photos/96574168@N02/24217001436/>

*D. limitis formosensis* is depicted in life online at:



<https://www.inaturalist.org/observations/98589105>  
and  
<https://www.inaturalist.org/observations/22192926>  
and  
<https://www.inaturalist.org/observations/78564111>  
and  
<https://www.inaturalist.org/observations/109822621>  
and

<https://www.flickr.com/photos/bobhawley/24487294678/>

*D. limitis sublimitis* is depicted in life online at:

[https://www.flickr.com/photos/gazs\\_pics/17840504359/](https://www.flickr.com/photos/gazs_pics/17840504359/)

*D. (Daboia) russelii* is readily separated from *D. (Daboia) crottyi* sp. nov. by having dark circles or similar of irregular shape along the mid-dorsal line that are boldly edged with black with both the inner and outer edge being well-defined. The inner part of these shapes is light brown.

By contrast in *D. crottyi* sp. nov. the same blotches are edged with dark brown (rather than black) and the inner edge is either poorly defined or of similar colour to the adjoining part of the inside of the blotch, which is also a dark to medium brown colour.

In *D. crottyi* sp. nov. the interspaces between the blotches on the dorsum are brownish, rather than yellowish as seen in *D. russelii*.

In effect the preceding two trait differences means that *D. russelii* is a boldly coloured snake, whereas *D. crottyi* sp. nov. is not.

All south Asian *Daboia*, (both subgenera) being the entirety of the genus as defined by Hoser (2012), are separated from all other vipers by the following suite of characters:

No sensory pit between nostril and eye; head very distinct from neck, above covered by small, keeled, imbricate scales, 6-9 between narrow supraoculars; nostril large, in large nasal shield which, below, is fused to the rostral; eye, with vertically elliptic pupil, surrounded by 10-15 small scales, 3-4 rows of small scales separating the circumocular scales from the upper labials; temporals small; 10-12 upper labials; 27-33 longitudinal rows of scales at midbody, all except outermost row strongly keeled; ventrals 153-180; subcaudals 41-64, all paired; colour above light brown with 3 longitudinal series of large black-margined brown spots or blotches, the vertebral series often merging to form a chain-like longitudinal stripe; in all species except *D. russelii* and *D. crottyi* sp. nov. there is an additional longitudinal series of small dark spots between the main vertebral and lateral series; yellowish white below occasionally with dark brown markings (modified from Leviton *et al.* 2003).

*Daboia* is separated from the closely related genus *Maxhoservipera* Hoser, 2012 by the less thick-set build of *Daboia* species and the fact that the dark blotch running into the eye is considerably wider than the eye, as opposed to being roughly the same width. *Daboia* species are further separated by the dorsal pattern which is not in the zig-zag configuration seen in the genus *Maxhoservipera*.

The pattern in *Daboia* is a colour pattern consisting of a deep yellow, tan or brown ground colour, with three series of dark edged spots that run the length of the body on the mid-line and flanks. Each of these spots has a black or dark brown ring around it, the outer border of which is sometimes intensified with a rim of white or yellow, but giving an impression of ovals, smooth circles or similar as opposed to the more typical viperine zig-zag or chain pattern. The dorsal spots, which usually number 23-30, may grow together, while the side spots may break apart (modified from Hoser, 2012).

*D. crottyi* sp. nov. is depicted in life online at:  
<https://www.inaturalist.org/observations/35578010>

and  
<https://www.inaturalist.org/observations/34441219>  
*D. russelii* in life is depicted online at:  
<https://www.inaturalist.org/observations/78201336>  
and  
<https://www.inaturalist.org/observations/36666824>  
and  
<https://www.inaturalist.org/observations/113401995>  
and  
<https://www.inaturalist.org/observations/71944667>  
and  
<https://www.inaturalist.org/observations/99969057>

Thorpe *et al.* (2007) found a 2-3 MYA divergence between what is herein treated as *D. sloppi* sp. nov. and its nearest congener.

**Distribution:** *D. sloppi* sp. nov. appears to be confined to the lower Mekong basin (Cambodia, south Vietnam, northern Thailand and Laos).

**Etymology:** *Daboia (Oxydaboia) sloppi* sp. nov. is named in honour of a Great Dane Dog, named "Slop", in recognition of the 9 years of service he has given guarding our wildlife research facility in Australia, noting he remains alive and reasonably well as of mid 2022. The name was also chosen as a species name as it is short, simple and easy to remember. The spelling "sloppi" is intentional and should not be altered.

#### CONSERVATION

This was discussed in the introduction part of this paper with respect of the actions of the Wolfgang Wüster gang of thieves and their unscientific actions with regards to taxonomy and nomenclature. The relevant comments in Hoser (1989, 1991, 1993 and 1996) also apply.

Relevant also is the holotype specimen of *Daboia (Oxydaboia) sloppi* sp. nov. from Cambodia, which is regarded as one of least degraded parts of south east Asia and still an ecological disaster zone, noting the snake was decapitated!

Educating people not to kill vipers on sight is never easy, especially in third world countries where medical treatment for snakebite is either costly, or almost impossible to obtain.

This isn't helped by the fact that in charge of snakebite at the World Health Organisation (WHO) in 2022 is Australian David John Williams, who is a convicted wildlife trafficker, who was previously fined \$7,500 at Cairns Magistrates Court for wildlife smuggling and extreme animal abuse and cruelty.

While Williams is an expert at self-promotion, under his watch, avoidable deaths from snakebite globally have escalated.

It is important that the six species and two additional subspecies of *Daboia* each be conserved as separate entities and that the long-term conservation outcomes should not be dictated on the premise that all comprise a widespread single species as contended in the edicts of Kaiser *et al.* (2013).

That document, and others like it, including Shine (1987), Shea (1987), Kaiser (2012a, 2012b, 2013, 2014) and Rhodin *et al.* (2015) discredited by numerous authors, including ICZN (1991, 2001, 2021), Cogger (2014), Dubois (2014), Dubois *et al.* (1988), Hoser (2007, 2009, 2012a-c, 2013, 2015a-f, 2017, 2019a-b) and Hawkeswood (2021) is still widely used by members of the same cohort to justify unscientific acts of theft and plagiarism and actions which hasten the extinction of threatened species as detailed in Hoser (2019a, 2019b). Reliance on Kaiser *et al.* (2013) and its many reincarnations by the same gang of thieves as a pretext for misguided or corrupt governments to formally ignore newly identified species is directly contributing to the extinction of some of these species as further documented by Hoser (2019a, 2019b).

*Daboia* species should not be among them.

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