

## Two new species of Cobra from South-east Asia (Serpentes: Elapidae: *Naja*).

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### ABSTRACT

In spite of a significant amount of interest in True Cobras, genus *Naja* Laurenti, 1768, including numerous taxonomic works over the past 200 years, new forms await discovery and formal identification. Recently named true cobras include *Boulengerina adelynhoserae* Hoser, 2013 and *Boulengerina jackyhoserae* Hoser, 2013. I note that recently a notorious criminal Welsh Wolfgang Wüster with an interest in venomous snakes has illegally coined some non-ICZN names in an unscientific publication for the same taxa. Those names should be ignored as they are at best junior synonyms and therefore cannot not used. This paper formally names two new species from south-east Asia in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999). These are *Naja reduci* sp. nov. from the Lesser Sundas, Indonesia, formerly treated as an eastern population of *N. sputatrix* Boie, 1827, and *N. latebras* sp. nov. from the north-east of Thailand and nearby parts of western Cambodia and south Vietnam, from within the Mekong drainage system, formerly treated as a population of *Naja kaouthia* Lesson, 1831. Formal identification and naming these two new species in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999) is the first and most important step in the long term protection of, and survival for, these two vulnerable snake taxa.

**Keywords:** Herpetology; taxonomy; snake; nomenclature; Asia; Cobra; *Naja*; Lesser Sundas; Komodo; Rinca; Flores; Alor; Indonesia; Thailand; Cambodia; Vietnam; *sputatrix*; *kaouthia*; *atra*; new species; *reduci*; *latebras*.

### INTRODUCTION

True Cobras, genus *Naja* Laurenti, 1768 are one of the world's iconic snake genera. They are not just well-known to science, but also to lay people the world over.

In spite of countless scientific investigations, Cobra taxonomy is far from settled. In 2013, Hoser (2013) formally named two overlooked species within the True Cobra genus *Boulengerina* Dollo, 1886 from Africa.

These were *Boulengerina adelynhoserae* Hoser, 2013 and *Boulengerina jackyhoserae* Hoser, 2013.

I note that recently a notorious Welsh animal abuser and criminal named Wolfgang Wüster with an interest in venomous snakes has coined some non-ICZN names for the same taxa.

As they are best junior synonyms of the correct ICZN names of Hoser (2013), the later names should not be used to identify the relevant taxa.

Two other species of unnamed Asiatic Cobra have been generally known in herpetology for some years and in view of the fact that no one has indicated a desire to formally name them, I decided to confirm that they were in fact distinct at the species level and then assuming they were so, to formally name them in

accordance with the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999) as amended since (ICZN 2012). Formally naming a new taxon is the first and most important step in the conservation of the species, assuming them to be a newly identified species.

The candidate species were 1/ The Lesser Sundas population of putative *N. sputatrix* Boie, 1827, long known to be morphologically divergent from the type form from Java (see for example De Lang 2011b), and 2/ The population of putative *Naja kaouthia* Lesson, 1831 identified as a species distinct from other Thai *N. kaouthia* inspected from North-east Thailand, north east of the central ranges in the upper reaches of the Mekong drainage, central Thailand near Bangkok and southern Thailand (see for example Ratnarathorn *et al.* 2019).

### MATERIALS AND METHODS

Specimens from across the range of putative *Naja sputatrix* Boie, 1827 and *Naja kaouthia* Lesson, 1831 in south-east Asia and 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 both potentially new species, to confirm likely distributions and zones of admixture during times of glacial minima and maxima.

Changes in rainfall and habitat over the past 5 million years were also assessed in terms of barrier creation for putative species and their potential divergences. This included cold zones, wet and dry zones and zones of inundation.

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

Literature relevant to the putative species *Naja sputatrix* Boie, 1827 including previously synonymised forms and relevant taxonomic decisions made herein include Auffenberg (1980), Bergman (1962), Berthold (1840, Boie (1827), Boulenger (1896), Chowdhury *et al.* (2021), Das (2012), De Lang (2011a, 2011b, 2017), De Lang and Vogel (2005), Harrington *et al.* (2018), Hoser (2009, 2012a, 2012b, 2013), Kopstein (1928, 1938), Mavromichalis and Silvia (1995), Mertens (1930), Milto and Lukin (2020), Pyron *et al.* (2013), Slowinski and Wüster (2000), Smetzers (1998), Van Hoesel (1958, 1959), Wallach *et al.* (2014), Wüster (1993, 1996a), Wüster and Thorpe (1989, 1991), Zonneveld *et al.* (2018) and sources cited therein.

Literature relevant to the putative species *Naja kaouthia* Lesson, 1831 including previously synonymised forms and relevant taxonomic decisions made herein include Ahmad *et al.* (2009), Barbour (1909), Boulenger (1896), Cantor (1842), Chan-ard *et al.* (1999, 2015), Cope (1860), Cox (1995), Cox *et al.* (1998), Currin (2016), Das (2012), Das *et al.* (2009), Das and Biswas (2017), Dutta *et al.* (2009), Frömberg (2007), Geissler *et al.* (2011, 2019), Giri *et al.* (2021), Gray (1834), Grismer *et al.* (2008a, 2008b), Grossmann and Tillack (2001), Gumprecht (2009), Hallmen (2005, 2006), Hartmann and Steiner (1985), Hoser (2009, 2012a, 2012b, 2013), Höröld (2009), Jackson (2002), Kästle *et al.* (2013), Kocczynski (1993), Kramer (1977), Kyi and Zug (2003), Laita (2013), Lalremsanga *et al.* (2011), Lalitpauia *et al.* (2008), Laopichienpong *et al.* (2016), Lenz (2012), Leong and Guttensohn (2018), Lesson (1831), Leviton *et al.* (2003), Lin *et al.* (2008), Lingenhöle and Trutnau (1989), Luu (2020), Mahony *et al.* (2009), Majumder *et al.* (2012), Manthey and Grossmann (1997), Murthy (2010), Nath *et al.* (2011), Nguyen *et al.* (2009), Nguyen *et al.* (2018), Olivier (2008), Orlov *et al.* (2003a, 2003b), Paira *et al.* (2022), Pandey (2018), Paterna (2019), Pauwels *et al.* (2013), Pham *et al.* (2020), Purkayastha (2013, 2018), Pyron *et al.* (2013), Ratnarathorn *et al.* (2019), Rosén (1904), Santra and Wüster (2017), Sharma (2004), Sharma *et al.* (2013), Smith (1943), Stejneger (1910), Thomas (1970), Tshewang and Letro (2018), Von Martens (1876), Wallach *et al.* (2014), Wangyal (2019), Whitaker and Captian (2004), Winchell (2003a, 2003b, 2011), Wüster (1993, 1996b, 1998), Wüster and Thorpe (1991, 1992), Wüster *et al.* (1995), Zhao (2006), Ziegler (2002), Zug and Mulcahy (2019) and sources cited therein.

I make a point of noting that while most of what the notorious animal abuser Wolfgang Wüster has published is unscientific rubbish, some does have relevance to Cobras and masquerades as works on the taxonomy of relevant species. As those publications were included in the thorough audit of the relevant species and relied upon in terms of the judgements herein (even though not surprisingly contrary to the judgements in those papers, as Wüster got the most important things completely wrong), it would be unethical for me not to cite them, or to pretend those works do not exist.

## RESULTS

*Prima facie*, the morphological divergence of Lesser Sundas putative *Naja sputatrix* Boie, 1827 as outlined by De Lang (2011), combined with the biogeographical evidence of a deep sea

barrier separating the easternmost populations (not being land at times of Ice Age maxima), was enough to confirm that they were of a different species. Inspection of specimens confirmed this contention and so this form is formally named as a new species, *Naja reduci* sp. nov. in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999) as amended since (ICZN 2012).

Other than the type form of *N. sputatrix* with a type locality of Java, that being a different species, there were no available synonyms for the Lesser Sunda population.

In terms of the north-east Thailand population of putative *Naja kaouthia* Lesson, 1831, a review of the literature was conducted first to confirm an absence of potential synonym names for this taxon.

The type form of *Naja kaouthia* Lesson, 1831 comes from Bengal, India and appears to be of the same or similar form as found in the north west, centre and south of Thailand, noting Laopichienpong *et al.* (2016) found them to be divergent. In any event, the name *Naja kaouthia suphanensis* Nutaphand, 1986, with a type locality of the Suphan Buri province in Central Thailand is also available for this population.

Other synonym names applied to the type form of *Naja atra* Cantor, 1842, which had already been identified by Ratnarathorn *et al.* (2019) as yet another distinctive species, meaning none could be applied to the potentially unnamed north-east Thai form that was morphologically like *N. kaouthia*.

The molecular results of Ratnarathorn *et al.* (2019), flagged the north-east Thailand population of putative *N. kaouthia* as a separate species to the central Thailand form of *Naja kaouthia*, (in turn flagged as separate from the type form from Bengal, India by Laopichienpong *et al.* 2016).

Ratnarathorn *et al.* (2019), also provided morphological evidence to support their contention.

In their paper they seemed confused as to which of the two populations were in fact of the type form of *N. kaouthia*, (probably neither) but my own inspection of specimens has confirmed that the most similar are the ones found across Thailand, except the north-east section which drains into the Mekong River system. Inspection of further specimens from Cambodia and parts of south-west Vietnam confirmed that this putative taxon also occupied these areas.

So in summary on the basis of molecular divergence, morphological differences and geographic allopatry, based on a known biogeographical barrier (being a set of high hills in central north Thailand), I have no hesitation in identifying this undescribed form as a new species.

The species is formally named *N. latebras* sp. nov. 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).

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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.

#### **NAJA REDUCI SP. NOV.**

**LSID**Durn:lsid:zoobank.org:act:A823B245-A2A0-470F-8789-06BFDD68EDA3

**Holotype:** A preserved specimen in the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA, specimen number MCZ Herp R-26982 collected from Komodo Island, East Nusa Tenggara Province, Lesser Sunda Islands, Indonesia.

This facility allows access to its holdings.

**Paratypes:** 1/ A preserved specimen in the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA, specimen number MCZ Herp R-26983 collected from Komodo Island, East Nusa Tenggara Province, Lesser Sunda Islands, Indonesia. 2/ Five preserved specimens in the University of Florida, Florida Museum of Natural History, Gainesville, Florida, USA, specimen numbers 28672 (male), 28678, 28679 (female), 28680 (female), and 39833 all collected from Komodo Island, East Nusa Tenggara Province, Lesser Sunda Islands, Indonesia.

**Diagnosis:** *Naja reduci* sp. nov. has until now been treated by all publishing authors as a Lesser Sundas population of *Naja sputatrix* Boie, 1827, with a type locality of Java and herein confined to that Island and Bali, as well as nearby Lombok and Sumbawa, the formal status of specimens on those latter two islands being somewhat uncertain as they are separated by a deep sea trench from both Java/Bali and all of Komodo, Rinca, Flores, Adonara and Lembata.

Based on morphology, the Cobras on Lombok and Sumbawa are tentatively referred to *N. sputatrix*.

*Naja reduci* sp. nov. is herein treated as the population found on the islands of Komodo, Rinca, Flores, Adonara and Lembata. The Cobras from Alor Island are tentatively treated herein as being of the same species due to similarity in form and colouration. All of Komodo, Rinca, Flores, Adonara and Lembata were connected during recent ice-age minima to the exclusion of the other named islands. Alor Island sits to the east of these islands and is proximal.

*Naja reduci* sp. nov. is separated from *Naja sputatrix* Boie, 1827 by the following suite of characters:

The hood when extended is narrower in that it is four scales wide, but when viewed from the underneath side, the bulge of the outermost scale, sits on the outer edge of the hood, versus wider in *N. sputatrix* where the hood is also four scales wide, but the bulge of the outermost scale, sits inside the outer edge of the hood; the lower two postoculars are tiny in *N. reduci* sp. nov. and when compared to the third postocular above, versus small, but of similar size to the one above in *N. sputatrix*; maximum adult size is 91 cm total length (Mertens 1930), versus 155 cm in *N. sputatrix* (Kopstein, 1928, 1934 and Bergman, 1962), which also corresponds with a thinner build in adult *N. reduci* sp. nov..

Both species (*N. reduci* sp. nov. and *N. sputatrix*) come in a variety of general colours as adults, ranging from black, dark

brown, olive, silver grey, bluish grey or even whitish, but are separated as follows: In *N. reduci* sp. nov. each dorsal scale has a whitish or yellowish anterior edge. In *N. sputatrix* this is not the case, meaning the dorsum is effectively unicolour. Cobra specimens from Lombok and Sumbawa have some lightening at the anterior edge, but it is of the same colour as the entire scale. In *N. reduci* sp. nov. there are usually 23 mid-body rows, versus usually 25 in *N. sputatrix* (but this trait varies in both species, so is not in itself diagnostic).

Both *N. reduci* sp. nov. and *N. sputatrix* are separated from all other Asiatic Cobras in the genus *Naja* (being the entirety of that genus as defined by Hoser 2009, as in not including African species as per the diagnosis in Hoser 2009), by the following unique combination of characters:

Head short and blunt, not distinct from the neck; Eye well-developed and with a round pupil, being one third to one half the length of the snout. No loreal. Rostral one and a quarter to one and a half times as broad as deep, its upper portion measuring one quarter to one half its distance from the frontal; internasals as long as or shorter than the prefrontals, in contact with the preocular; frontal as long as broad or longer than broad, as broad as or little broader than the single supraocular, as long as or a little longer than its distance from the rostral; one preocular; three postoculars; temporals 2+3; seven upper labials, third deepest, seventh largest, third and fourth entering the eye; four lower labials in contact with the anterior chin-shields, which are as long as or longer than the posterior ones.

Body scales smooth and body firm; neck dilatable (to four scales wide when viewed from the ventral side). 21-35 scales round the neck, usually 23 mid-body scale rows, but ranging from 17 to 25. Ventrals 160-188; anal entire; subcaudals 40-56.

Colouration variable, including black, dark brown, olive, silver grey, bluish grey or even whitish. Venter is white to yellow. Sometimes some ventrals, usually around numbers 14-23 have dark-grey posterior edges. The anterior edges of the ventrals and the outer dorsal scale rows are white or yellow, which contrasts with the darker dorsal colour (and even more so in young animals). Neck markings are barely discernable or absent; usually being in the form of a small light mark on either side of the vertebral line, or less often a faint v-shaped mark, with the apex directed posteriorly. As a rule there is one or more dark, transverse throat bands, which become visible when the neck is expanded. Juveniles commonly lack neck markings (the preceding also being largely modified from Boulenger 1986 and De Lang 2011b as a template).

*N. reduci* sp. nov. in life is depicted in De Lang (2011b) on pages 142, 144, 145 and 147 at top, as well as online at: <https://www.inaturalist.org/observations/39525104> and

<https://www.inaturalist.org/observations/35630270>

*N. sputatrix* in life is depicted online at:

<https://www.inaturalist.org/observations/36740255>

and

<https://www.inaturalist.org/observations/120819785>

and

<https://www.inaturalist.org/observations/65990526>

In common with other large elapids of generalized habits, *N. reduci* sp. nov. appear to do well in human altered habitats finding shelter under man made debris, including of course, sheets of metal and with the added benefit of a food source in the form of rodents, meaning they tend to gravitate to places that provide such items.

**Distribution:** *Naja reduci* sp. nov. is herein restricted to the islands of Komodo, Rinca, Flores, Adonara and Lembata. Cobras found on islands east or west of these may not be of this taxon.

**Etymology:** The name *Naja reduci* sp. nov. comes from the Latin word "reduc" which means reduced in size, in reflection of the size reduction of this form as compared to the closely related species *N. sputatrix* to which it is most closely related.

**NAJA LATEBRAS SP. NOV.**

**LSID**Durn:lsid:zoobank.org:act:0CEDEA2F-7A6E-4553-8484-E4D3FD3CD7C7

**Holotype:** A preserved specimen at the Field Museum of Natural History, Chicago, Illinois, USA, specimen number FMNH Amphibians and Reptiles 259176 collected from Siem Reap Province, Cambodia.

This facility allows access to its holdings.

**Paratype:** A preserved specimen at the Field Museum of Natural History, Chicago, Illinois, USA, specimen number FMNH Amphibians and Reptiles 259118 collected from the Kien Giang, Vinh Thuan District, Vietnam.

**Diagnosis:** Until now *Naja latebras sp. nov.* has been treated as a population of the better-known species *Naja kaouthia* Lesson, 1831, with a type locality of Bengal, India, herein taken as including divergent specimens from central, southern and north-west Thailand (for which the name *Naja kaouthia suphanensis* Nutaphand, 1986 is available) or possibly *Naja atra* Cantor, 1842 with a type locality of Zhoushan, China, also found in nearby north Vietnam, which are all quite different taxa.

*Naja latebras sp. nov.* is separated from *Naja kaouthia* Lesson, 1831 of both type form from India/Bangladesh and specimens from central Thailand near Bangkok as well as the south of Thailand and north-west (and *Naja atra* Cantor, 1842) by the following unique combination of characters:

Dorsum is a dark, blackish, olive brown colour, becoming yellowish on the very lower flanks (usually a silver black in younger specimens); interstitial skin is light brown to whitish (versus dark grey to black in both *N. kaouthia* and *N. atra*); light part of the monacle on the hood is beige bounded on both sides with a jagged clack edge, the inside being slighter more blackish than the outside areas of the dorsum; black spots on the ventral scales seen in *N. kaouthia* are either reduced in intensity (as in faded) and sometimes absent in *N. latebras sp. nov.*; when viewed, the head of *N. latebras sp. nov.* appears to be flatter and wider posteriorly and longer at nasal area than in *N. kaouthia*. Anteriorly, the dorsum of *N. latebras sp. nov.* is fractionally darker than at the rear of the body. By contrast in *N. kaouthia* the posterior part of the dorsum is noticeably darker.

All of *Naja latebras sp. nov.*, *N. kaouthia* (both central and west Thai form and that from the type locality region in India/Bangladesh) and *N. atra* are separated from all other Asiatic Cobras in the genus *Naja* (being the entirety of that genus as defined by Hoser 2009, as in not including African species as per the diagnosis in Hoser 2009), by the following unique combination of characters:

Eye moderate, being one third to one half the length of the snout. Rostral one and a quarter to one and a half times as broad as deep, its upper portion measuring a quarter to a half its distance from the frontal; internasals as long as or shorter than the prefrontals, in contact with the preocular; frontal as long as broad or longer than broad, as broad as or little broader than the single large supraocular, as long as or a little longer than its distance from the rostral; one preocular; three (occasionally two) postoculars; temporals 2+3 or 3+3; seven upper labials, third deepest, seventh largest, third and fourth entering the eye; four lower labials in contact with the anterior chin-shields, which are as long as or longer than the posterior. Neck dilatatable. 21-35 scales round the neck, 17-25 midbody rows. 163-205 ventrals. Single anal. 42-75 subcaudals.

Colouration is yellowish to dark brown, olive brown or blackish above, sometimes variable along the length of the snake and sometimes with more or less distinct light, black-edged cross-bars with a black-and-white or black-and-yellowish spectacle-mark on the hood usually black edged inside and out, or in a U-shape with a mask-shaped figure, as well as a black-and-white spot on each side of the lower surface of the hood. One or two dark brown cross-bands on the belly behind the hood.

*Naja latebras sp. nov.* in life from the type locality (Siem Reap Province, Cambodia) is depicted online at:

<https://www.inaturalist.org/observations/64191311>

*N. kaouthia* from the type region in India are depicted in life online at:

<https://www.inaturalist.org/observations/61787474> and

<https://www.inaturalist.org/observations/97231454>

Putative *N. kaouthia* from central Thailand are depicted in life online at:

<https://www.inaturalist.org/observations/42676461>

and

<https://www.inaturalist.org/observations/88249942>

If they are later determined not to be *N. kaouthia* in the strictest sense (*sensu* Ratnarathorn *et al.* 2019), then the name *Naja kaouthia suphanensis* Nutaphand, 1986 is available for these animals.

*N. atra* from China are depicted in life online at:

<https://www.inaturalist.org/observations/77806825>

and

<https://www.inaturalist.org/observations/100583277>

**Distribution:** *Naja latebras sp. nov.* appears to be distributed around the lower Mekong drainage in north-east Thailand, nearby Cambodia and south Vietnam.

**Etymology:** The species name *Naja latebras sp. nov.* comes from the Latin word “*latebras*” which means hiding, this being a good description of this species in that it has been hiding from science for the past 200 years.

**CONSERVATION**

In terms of both the above newly identified species, the comments of Hoser (1989, 1991, 1993, 1996, 2007, 2019a, 2019b) apply as do those of Chowdhury *et al.* (2021) and Paira *et al.* (2022).

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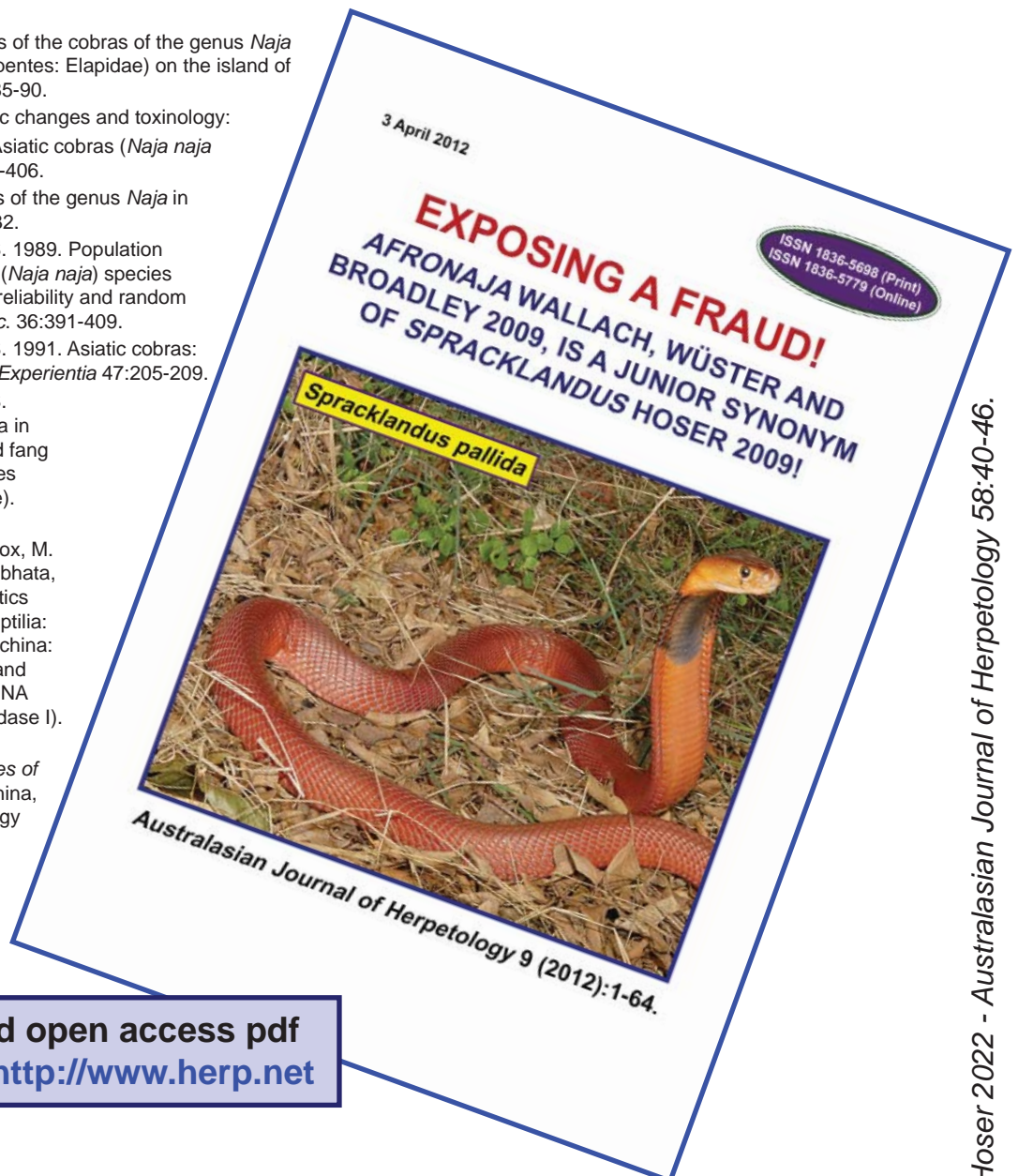
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**CONFLICT OF INTEREST - NONE.**

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