

Three new species of Kraits in the *Bungarus fasciatus* (Schneider, 1801) species complex.

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ABSTRACT

Scrutiny of specimens of putative Krait species within the *Bungarus fasciatus* (Schneider, 1801) species complex in the past four years has confirmed the recognition of three relevant species as previously recognised by Hoser (2018) (then as subspecies), being *Bungarus fasciatus* (Schneider, 1801), with a type locality of Bengal, India, *Bungarus bifasciatus* (Mell, 1929), with a type locality of southern Kwangsi, south-east China and *Bungarus insularis* (Mell, 1930) from "The Malay Archipelago", being of the form found primarily in Java, but also occurring in nearby Sumatra, Bali and southern Borneo.

Inspection of specimens of putative *B. bifasciatus* from central and southern Thailand, and the Mekong drainage to the east, showed consistent morphological divergences from those from south-east China and north Vietnam, indicating species level divergence of these populations from both *B. bifasciatus*, the other two named forms in the complex and each other.

A study by Biakzuala *et al.* (2023), agreed with the findings of Hoser (2018) in recognizing the three species in the *Bungarus fasciatus* complex with available names, but at the species level, however mistakenly believing that the two forms previously named by Rudolf Emil Mell were unnamed.

They also implied species-level divergence for one or more populations within their so-called Clade 3, representing mainly Chinese animals.

On the basis of the preceding facts, including distributional disjunction between the relevant forms, as well as consistent morphological divergence, the southern Thailand population and that of the Mekong drainage are formally described according to the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999) as the new species, *Bungarus crotalusei* sp. nov. and *B. daranini* sp. nov.. *Bungarus crotalusei* sp. nov. appears to be split into two divergent populations, with those specimens south of the Isthmus of Kra to Singapore formally assigned to the subspecies *Bungarus crotalusei peninsularensis* subsp. nov..

Specimens from north Sarawak, Borneo, are also clearly divergent from all others, although morphologically most similar to those of type *B. insularis*. They are biogeographically isolated from all other populations and so are also formally named as a new species, *B. oxyi* sp. nov..

Keywords: Taxonomy; nomenclature, reptile; snake; elapid; Krait; *Bungarus*; *fasciatus*; *bifasciatus*; *insularis*; Asia; Thailand; Malaysia; Indonesia; India; China; Guangxi; Burma; Laos; Vietnam; Myanmar; Siam; Malay Peninsula; Borneo, Mekong; Chao Phraya; Sarawak; new species; *crotalusei*; *daranini*; *oxyi*; new subspecies; *peninsularensis*.

INTRODUCTION

The iconic Kraits of south-east Asia are known to herpetologists globally. Locally common and studied extensively, Hoser (2018) published a review of the genus *Bungarus* Daudin, 1803 *sensu lato* splitting the genus four-ways and resurrecting from synonymy available names for each. One species and two subspecies were also formally named for the first time.

Bungarus sensu stricto, only included the putative species *Pseudoboia fasciata* Schneider, 1801, with a type locality of

Bengal, India, which Hoser formally divided into three subspecies, using the names previously proposed by Rudolf Emil Mell in 1929/1930, for the other relevant subspecies.

These were *Bungarus fasciatus bifasciatus* Mell, 1929, with a type locality of Kwangsi, southern China and *Bungarus fasciatus insularis* Mell, 1930 from "The Malay Archipelago" (being of the Javanese form).

The three named forms and their type localities, effectively also pointed to the extreme points in the west, east and south for the

distribution of species complex in east and south-east Asia, this being the eastern Indian subcontinent in the west, southern China in the north-east and the Malay Archipelago (Indonesia) in the south-east.

A study by Biakzuala *et al.* (2023), agreed with the findings of Hoser (2018) in recognizing the three species in the *Bungarus fasciatus* complex with available names, but at the species level, however mistakenly believing that the two forms previously named by Mell were unnamed.

They also implied species-level divergence of some populations within nominate *B. bifasciatus* (their Clade 3) from China, Vietnam, and Thailand but gave no evidence of either distributional disjuncture or morphological divergence of this general population.

Separate studies by myself over the four years since the publication of Hoser (2018) also corroborates the taxonomic position of Biakzuala *et al.* (2023), viz, elevation of the three previously named subspecies to full and separate species, but has gone further in determining the distributions of various forms of putative *Bungarus bifasciatus* (Mell, 1929) in China, Vietnam, Laos, Cambodia and Thailand, and confirmed that there are in fact three two allopatric species, based on consistent morphological divergence and allopatric distributions.

These also appear to match the main drainage basins in the region, coupled with high elevation mountain barriers sufficient to constrain each population.

Inspection of specimens of putative *B. bifasciatus* from the central Thailand basin and southern Thailand on the upper Malay Peninsula (near the Gulf of Thailand), showed consistent morphological divergence from those from China and Vietnam (Mekong drainage and north, including relevant parts of north-east Thailand), indicating species level divergence of this population from both *B. bifasciatus* and the others in the complex.

In turn those of the Mekong drainage, running from Yunnan, China, south through Myanmar (Burma), Laos, Thailand, Cambodia and Vietnam, appear divergent from both the south-east Chinese animals (including specimens from nearby north Vietnam), and those from the central Thai lowlands.

The divergent taxa (all five) appear to match the main drainage basins of south-east Asia, noting the relevant basins are best seen in the Ice-age maps of Voris (2000).

Putative *B. insularis* matches the drainages emptying relevant parts of Java, Sumatra, south-western Borneo and putative *B. fasciatus*, matches the main north-south drainages of north Eastern India and Myanmar.

On the basis of the preceding facts, the main Thailand population, of the Chao Phraya drainage basin is formally described according to the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999) as a new species, *Bungarus crotalusei sp. nov.*

Bungarus crotalusei sp. nov. appears to be split into two divergent populations, with those specimens south of the Isthmus of Kra to Singapore formally assigned to the subspecies *Bungarus crotalusei peninsularenensis subsp. nov.*

The divergent Mekong drainage population is formally named *B. daranini sp. nov.*

Furthermore, inspection of specimens from north Borneo, mainly in the Limbang and Baram River drainages of Sarawak, also were clearly divergent from all others.

While morphologically most similar to those of type *B. insularis*, they have significantly wider yellow bands on the dorsum, relative to the alternating black ones and dark upper edges of the upper labials, versus white in *B. insularis*.

Based on Ice-age drainages as shown by Voris (2000), these snakes are biogeographically isolated from all other populations and so are also formally named as a new species, *B. oxyi sp. nov.*

MATERIALS AND METHODS

Live, dead, and photos of specimens within the putative *Bungarus fasciatus* complex were inspected from almost all parts of the known distribution, including India, Bangladesh, Burma, Thailand, Laos, Cambodia, Thailand, China, Malaysia (both sides), Singapore and Indonesia (including Java, eastern Sumatra, southern and northern Borneo, including Sarawak, Malaysia),

with the specific view of determining any consistent differences between populations.

Specimens from Bhutan, Brunei and Nepal were not inspected, although ones from immediately proximal locations were.

Known distributions were assessed, based on specimen data with good and accurate locality data (mainly using Museum accessions and specimens photographed in the wild and posted online on photo sharing sites such as "flickr.com" and "inaturalist.org"), and attempting to screen out specimens or data potentially translocated by people.

A review of the relevant literature was conducted to further attempt to properly define the relevant forms and separate them from one another, as well as to confirm that the only three available synonym names for specimens in the complex as of the time this paper was prepared were, 1/ *Bungarus fasciatus* (Schneider, 1801), type locality Bengal, India 2/ *Bungarus annularis* Daudin, 1803, (same type details as for *B. fasciatus*), 3/ *Bungarus fasciatus bifasciatus* Mell, 1929, type locality Yao-shan, Kwangsi Province (Guangxi), China and 4/ *B. fasciatus insularis* Mell, 1930, type locality the Malay Archipelago.

The review also assisted in flagging potential differences between the locally occurring forms throughout the range, as well as sexual dimorphism.

Texts relevant to this review and the taxonomic conclusions within this paper included Ahsan and Rahman (2017), Anwar (2011), Auliya (2006), Bhattarai *et al.* (2017, 2018, 2020), Biakzuala *et al.* (2021, 2023), Boulenger (1896, 1890), Buden and Taboroši (2016), Castoe *et al.* (2007), Chan-ard *et al.* (1999, 2015), Chen *et al.* (2021), Chettri and Chhetry (2013), Cox *et al.* (1998), Das *et al.* (2009), Das (2012), Das and Palden (2000), Daudin (1803), David and Vogel (1996), de Lang (2017), Deshmukh *et al.* (2020), Deuve (1961), Dowling and Jenner (1988), Duméril *et al.* (1854), Dutta *et al.* (2009), Evans (1905), Francis (2021), Fukuyama *et al.* (2021), Gawor *et al.* (2016), Geissler *et al.* (2011), Grismer *et al.* (2008), Hakim *et al.* (2020), Hecht *et al.* (2013), Hofmann *et al.* (2016), Hoser (2018, 2022), Ingle (2020), Janzen (2022), Kästle *et al.* (2013), Khoerunisa *et al.* (2021), Kinnear (1913), Kopstein, (1938), Kuch (1998), Kuch and Schneyer (1993), Kuch *et al.* (2005), Laopichienpong *et al.* (2016), Lenz (2012), Leviton *et al.* (2003), Mahabal and Thakur (2014), Mahony *et al.* (2009), Majumder *et al.* (2012), Majumder (2022), Malkmus *et al.* (2002), Malsawmdawngliana *et al.* (2022), Manthey and Grossmann (1997), Marshall and Strine (2019), Martin (1913), Mell (1929, 1930), Murthy (2010), Murthy *et al.* (2011), Nguyen *et al.* (2009), Nguyen *et al.* (2018), Pandey (2018), Pauwels *et al.* (2003), Prill and Dehling (2021), Purkayastha (2013, 2018), Purkayastha *et al.* (2011), Rabbe *et al.* (2022), Ratnarathorn *et al.* (2019), Rawat *et al.* (2020), Ride *et al.* (1999), Russell (1796), Saint Girons (1972), Schneider (1801), Schulz and Slegers (1985), Shah (1998), Sharma (2004), Sharma *et al.* (2013), Smith (1914, 1943), Stuebing and Inger (1999), Stuebing *et al.* (2014), Supikamolseni *et al.* (2015), Taylor (1965), Tenzin *et al.* (2022), Teynie *et al.* (2010), Thakur (2011), Visvanathan *et al.* (2022), Voris (2000), Wall (1905, 1906, 1908), Wallach *et al.* (2014), Wang *et al.* (2022), Wang *et al.* (2020, 2022), Wangyal (2019), Whitaker and Captain (2004), Zeeb (2012), Zhao (2006), Zhao and Adler (1993), Ziegler (2002), Zug and Mitchell (1995), Zug and Mulcahy (2019) and sources cited therein.

RESULTS

As noted in the abstract and introduction, it was almost immediately self-evident that the population of putative *B. fasciatus* or *B. bifasciatus* from the central Thailand basin and the areas south that border the Gulf of Thailand were sufficiently divergent from all others in the complex to warrant being identified as a separate species, as were those from the Mekong basin, separated from one another by a series of north-south running ranges.

These snakes that are distributionally disjunct by way of major drainage basins (see Voris, 2000), separated by ranges not inhabited by these snakes, were shown by Biakzuala *et al.* (2023) to have species-level molecular divergence from their nearest congener/s and furthermore are consistently divergent in

morphology to enable a formal diagnosis.

On the basis of the preceding, I have no hesitation in formally naming these relevant populations as *Bungarus crotalusei* sp. nov. for the Chao Phraya basin population and *B. daranini* sp. nov. for the Mekong basin population in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride et al. 1999).

The population in Thailand south of the Isthmus of Kra appear to be morphologically divergent from those to the north in Thailand.

However they are apparently associated with the same main drainage system as inferred by the 120 metre sea depth reduction map shown in Voris (2000), meaning that isolation of the populations was recent.

Hence this population, extending south to Singapore, is formally named herein as the subspecies *Bungarus crotalusei peninsularenis* subsp. nov. rather than as a separate full species.

Based on "Map A" in Voris (2000), the drainage basin including Singapore and the lower Malay Peninsula (The so-called "Siam River system"), is not connected to that linking east Sumatra, Java, Bali and southern Borneo, indicating long term separation from that population (that being drained by the "East Sunda River"). Voris (2000) at "Map A" even shows a major drainage system between the other two (the "North Sunda River"), further separating the relevant populations.

As previously noted in the introduction, inspection of specimens from north Borneo, mainly in the Limbang and Baram River drainages of Sarawak, also were clearly divergent from all others.

While morphologically most similar to those of type *B. insularis*, and lower Malay Peninsula *B. crotalusei peninsularenis* subsp. nov. specimens, they have significantly wider yellow bands on the dorsum, relative to the alternating black ones (separating them from *B. crotalusei peninsularenis* subsp. nov.) and dark upper edges of the upper labials, versus white in the Javanese type form of *B. insularis*.

Based on Ice-age drainages as shown by Voris (2000), these snakes are probably biogeographically isolated from all other populations and so are also formally named as a new species, *B. oxyi* sp. nov..

Specimens from south-west Borneo, are morphologically similar to *B. oxyi* sp. nov., but are generally a darker yellow in background colour (and versus cream or whitish-yellow in *B. insularis*) and may in fact represent yet another taxon, as they correspond with the so called "North Sunda River System".

Assigning them to a given taxon has been deferred pending access to more material.

INFORMATION RELEVANT TO THE FORMAL DESCRIPTIONS THAT FOLLOW

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 a relevant staff at museums who made specimens and records available in line with international obligations.

In terms of the following formal descriptions, spelling 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.

Material downloaded from the internet and cited anywhere in this paper was downloaded and checked most recently as of 14 February 2023, unless otherwise stated and were accurate in terms of the context cited herein as of that date.

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

While numerous texts and references were consulted prior to publication of this paper, the criteria used to separate the relevant species 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.

Delays in recognition of these species and subspecies could

jeopardise the long-term survival of the taxa as outlined by Hoser (2019a, 2019b) and sources cited therein (see also Mitchell 1948 and Peters 1863).

Therefore attempts by taxonomic vandals like the Wolfgang Wüster gang via Kaiser (2012a, 2012b, 2013, 2014a, 2014b) and Kaiser et al. (2013) (as frequently amended) to unlawfully suppress the recognition of these taxa on the basis they have a personal dislike for the person who formally named it should be resisted (Cogger 2014, Dubois et al. 2019).

Claims by the Wüster gang against this paper and the descriptions herein will no doubt be no different to those the gang have made previously, all of which were discredited long ago as outlined by Dubois et al. (2019), Hoser, (2007, 2009a, 2012a, 2012b, 2013, 2015a-f, 2019a, 2019b), ICZN (1991, 2001, 2012, 2021) and sources cited therein.

Some material within descriptions is repeated to ensure each fully complies with the *International Code of Zoological Nomenclature* (Ride et al. 1999).

BUNGARUS CROTALUSEI SP. NOV.

LSIDurn:lsid:zoobank.org:act:826822C5-8AB1-48CC-8D51-8C81E15A2339

Holotype: A preserved specimen at the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA, specimen number MCZ Herp R-20340 collected from near Bangkok, Thailand.

This facility allows access to its holdings.

Paratypes: 1/ A preserved juvenile male specimen at the National Museum of Natural History, Smithsonian Institution, Washington, DC, USA, specimen number USNM Amphibians and Reptiles 72061 collected from Bangkok, Thailand.

2/ A preserved male specimen at the Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, USA, specimen number CM Herps 145381 collected from Bangkok, Thailand.

Diagnosis: The genus *Bungarus* Daudin, 1803, herein including the six species, *B. fasciatus* (Schneider, 1801), from east India, Bangladesh, Myanmar (Burma), Bhutan and Nepal, *B. bifasciatus* (Mell, 1929) from south China and nearby parts of north Vietnam and Laos, *B. insularis* (Mell, 1930) from Java, Bali, east Sumatra and southern Borneo, *B. crotalusei* sp. nov. from central and southern Thailand (and presumably also the lower Malay Peninsula, viz, Malaysia and Singapore), *B. daranini* sp. nov. from the Mekong River drainage basin, including relevant parts of Yunnan, China, Myanmar (Burma), Laos, Cambodia and southern Vietnam and *B. oxyi* sp. nov. from north-west Borneo (North Sarawak and Brunei) are separated from all other species in the tribe Bungarini Eichwald, 1831 by the following unique character suite: Subcaudals single; 15 or rarely 17 dorsal mid-body rows; a dorsal ridge formed by underlying spinous processes of the vertebrae manifesting as a row of enlarged scales along the mid-vertebral line; tail ends very obtusely, sometimes with a swollen tip; a large black mark on nape reaches to between the eyes and the anterior temporal shield is scarcely longer than deep (modified from Hoser, 2018).

These snakes are further characterised by having 199-237 ventrals, 23-41 subcaudals, nuchal band covered by 14-20 vertebral scales; 19-31 black dorsal bands on the body, 2-7 dorsal bands on the tail and a yellow or whitish-cream background colour on the dorsum.

The six species are each separated from one another by the following unique suites of characters:

B. fasciatus has a yellow background colour, 22-31 dorsal bands on the body, 4-7 dorsal bands on the tail, dark yellow upper labials, boldly etched with black and a temporal formula of 1+2+3.

B. bifasciatus, *B. crotalusei* sp. nov. and *B. daranini* sp. nov. all have 19-21 dorsal bands on the body, (which alone separates them from *B. fasciatus*), a deep yellow background colour, 4-6 dorsal bands on the tail and a temporal formula of 1+2+3, 1+2+2, 2+2+3 or 2+2+2.

B. crotalusei sp. nov. is in turn separated from *B. bifasciatus* by having upper labials that are yellow in colour, but consistently dark edged at the anterior margins, versus the yellow of the upper

labials being heavily peppered (rather than immaculate) in *B. bifasciatus* with the dark markings over the upper labials being in the form of distinctive dark patches in the form of rectangles or similar, rather than uniform etchings of the anterior of each scale.

The subspecies *B. crotalusei peninsularenensis subsp. nov.* is similar in most respects to *B. crotalusei sp. nov.* but instead of a deep yellow colour between the black bands on the dorsum, it has light yellow or cream interspaces on the dorsum, similar to that seen in *B. insularis* and *B. oxyi sp. nov.*

B. crotalusei peninsularenensis subsp. nov. is further separated from *B. crotalusei sp. nov.* by having mainly black on the upper labials, including the inner parts of each and the lower parts, versus yellow and etched dark in *B. crotalusei sp. nov.*, or with dark patches between yellow sections as seen in *B. bifasciatus*.

B. bifasciatus and *B. daranini sp. nov.* have a temporal formula of 1+2+2 or 2+2+2, versus 1+2+3 or 2+2+3 in *B. crotalusei sp. nov.* (and *B. crotalusei peninsularenensis subsp. nov.*).

B. bifasciatus, *B. crotalusei sp. nov.* and *B. daranini sp. nov.* have 217-237 ventrals, that separates them from *B. insularis* which in turn has 199-210. *B. fasciatus* and *B. oxyi sp. nov.* are intermediate with 200-234 ventrals.

B. daranini sp. nov. is separated from both *B. bifasciatus* and *B. crotalusei sp. nov.* by having upper labials that are mainly yellow, with limited peppering on the surfaces and the dark etching forming downward pointing triangles running from the upper edge of the upper labials.

Both *B. daranini sp. nov.* and *B. bifasciatus* are separated from *B. crotalusei sp. nov.* by having dark cross bands on the dorsum being much wider than the intervening yellow, versus not so in *B. crotalusei sp. nov.*

B. daranini sp. nov. is also readily separated from both *B. bifasciatus* and *B. crotalusei sp. nov.* by having the dark cross-bands significantly curl in on the lower flanks, versus not so in the other two species.

B. insularis and *B. oxyi sp. nov.* are separated from the other four species in the genus (the genus as defined by Hoser 2018 and above), by having a washed out yellow or cream/yellow to whitish background colour, versus rich or dark yellow in the four mainland Asian species detailed above (except for the similarly light subspecies *B. crotalusei peninsularenensis subsp. nov.*).

B. oxyi sp. nov. is in turn separated from *B. insularis* by having black bands on the dorsum of significantly narrower in width than the yellow background bands, versus the reverse situation in *B. insularis*, or bands of similar width in all other species in subspecies, except for *B. crotalusei peninsularenensis subsp. nov.*, which also has black bands wider than the lighter intervening areas (versus reverse in the otherwise morphologically similar *B. oxyi sp. nov.*).

In *B. oxyi sp. nov.* (and *B. crotalusei peninsularenensis subsp. nov.*), the lower parts of the upper labials are generally dark in colour, versus generally light (cream) in *B. insularis*.

B. oxyi sp. nov. has a temporal formula of 1+2+2, versus 1+2+3 in *B. insularis*.

The detailed description of Taylor (1965) for Thai "*B. fasciatus*" from Chiang Mai, Chiang Mai Province, northern Thailand, on pages 944 and 945 is in fact of the species *B. crotalusei sp. nov.*. *B. fasciatus* is depicted online at:

<https://www.inaturalist.org/observations/69550594>

and

<https://www.inaturalist.org/observations/136658715>

and

<https://www.inaturalist.org/observations/59563338>

B. bifasciatus is depicted online at:

<https://www.flickr.com/photos/189071256@N05/50396259431/>

and

<https://www.inaturalist.org/observations/128112623>

and

<https://www.inaturalist.org/observations/155757022>

and

<https://www.inaturalist.org/observations/49354797>

B. crotalusei sp. nov. is depicted on page 944 of Taylor (1965) and online at:

<https://www.flickr.com/photos/98482848@N00/2247764883/>

and

<https://www.inaturalist.org/observations/142717704>

and

<https://www.inaturalist.org/observations/109511692>

and

<https://www.inaturalist.org/observations/64802846>

B. crotalusei peninsularenensis subsp. nov. is depicted online at:

<https://www.inaturalist.org/observations/106616831>

and

<https://www.inaturalist.org/observations/96553489>

and

<https://www.inaturalist.org/observations/7655880>

B. daranini sp. nov. is depicted online at:

<https://www.inaturalist.org/observations/56005784>

and

<https://www.inaturalist.org/observations/127111416>

and

<https://www.inaturalist.org/observations/74749317>

and

<https://www.inaturalist.org/observations/101870376>

B. insularis is depicted online at:

<https://www.inaturalist.org/observations/101457607>

and

<https://www.inaturalist.org/observations/37187167>

and

<https://www.inaturalist.org/observations/67850292>

B. oxyi sp. nov. is depicted online at:

<https://www.inaturalist.org/observations/147167858>

and

<https://www.inaturalist.org/observations/42482785>

Distribution: *Bungarus crotalusei sp. nov.* appears to be confined to the central parts of Thailand and the northern Malay Peninsula in southern Thailand and nearby northern Peninsula Malaysia. Specimens from the lower Malay Peninsula are also tentatively referred to this species (see the description of *B. crotalusei peninsularenensis subsp. nov.* below).

The Himalayan-Tanasori Mountains form a barrier to the west, separating this taxon from *B. fasciatus*, while the Don Phaya Yen and Sankamphaeng Mountains in the east of Thailand form a separate barrier, partitioning this taxon from *B. daranini sp. nov.* which occupies the Mekong River basin to the east.

Etymology: The species *Bungarus crotalusei sp. nov.* is named in honour of a Great Dane cross Rottweiler dog, named "Crotalus", AKA Crotty, owned by myself in the period 1989 to 2002, in recognition of his role in guarding our research facility in Melbourne, Victoria, Australia from thieves. The spelling of the name "crotalusei" is intentional and should not be altered unless mandated by governing rules.

BUNGARUS DARANINI SP. NOV.

LSIDurn:lsid:zoobank.org:act:2D7E1D41-0923-4940-A0CF-FD1483BEB062

Holotype: A preserved specimen in the North Carolina Museum of Natural Sciences, Raleigh, North Carolina, USA, specimen number NCSM-Herp 80736 collected alive on a dirt road through scrub and semi-evergreen forest along the Nam Lan River (part of the Mekong River drainage basin), from the Nam Lan Conservation Area, Ban Na Ten Village, at 683 m elevation, Boun Tai, Phongsaly, Laos, Latitude 21.3324 N., Longitude 101.8826 E. This facility allows access to its holdings.

Paratypes: 1/ A preserved specimen in the North Carolina Museum of Natural Sciences, Raleigh, North Carolina, USA, specimen number NCSM-Herp 86467 collected on the ground, 2 metres from a swift rocky stream in a semi-evergreen forest at 609 metres elevation, at Houay Lick, in the Phou Dendin National Protected Area, Phongsaly, Laos, Latitude 22.0676 N., Longitude

102.243 E.

2/ A preserved specimen in the Herpetology Collection of the Royal Ontario Museum, Toronto, Canada, specimen number ROM 41546, collected from 8.8 km west of Simao, Yunnan, China, Latitude 22.77998 N., Longitude 100.906677 E.

3/ A preserved adult specimen in the North Carolina Museum of Natural Sciences, Raleigh, North Carolina, USA, specimen number NCSM-Herp 84993 collected from leaf litter in semi-evergreen forest with limestone karst at MMG Sepon Mine, Tham Bing, Vilabouli, Savannakhet, Laos at 262 metres elevation, Latitude 16.9503 N., Longitude 105.8959 E.

4/ A preserved male specimen at the National Museum of Natural History, Smithsonian Institution, Washington DC, USA, specimen number USNM Amphibians and Reptiles 68141, collected from 90 km up the Mekong River from Vientiane, in Laos.

5/ A preserved male specimen at the National Museum of Natural History, Smithsonian Institution, Washington DC, USA, specimen number USNM Amphibians and Reptiles 279012, collected from Nakhon Phanom Royal Thai Air Force Base, Thailand.

Diagnosis: The genus *Bungarus* Daudin, 1803, herein including the six species, *B. fasciatus* (Schneider, 1801), from east India, Bangladesh, Myanmar (Burma), Bhutan and Nepal, *B. bifasciatus* (Mell, 1929) from south China and nearby parts of north Vietnam and Laos, *B. insularis* (Mell, 1930) from Java, Bali, east Sumatra and southern Borneo, *B. crotalusei* sp. nov. from central and southern Thailand (and presumably also the lower Malay Peninsula, viz, Malaysia and Singapore), *B. daranini* sp. nov. from the Mekong River drainage basin, including relevant parts of Yunnan, China, Myanmar (Burma), Laos, Cambodia and southern Vietnam and *B. oxyi* sp. nov. from north-west Borneo (North Sarawak and Brunei) are separated from all other species in the tribe Bungarini Eichwald, 1831 by the following unique character suite: Subcaudals single; 15 or rarely 17 dorsal mid-body rows; a dorsal ridge formed by underlying spinous processes of the vertebrae manifesting as a row of enlarged scales along the mid-vertebral line; tail ends very obtusely, sometimes with a swollen tip; a large black mark on nape reaches to between the eyes and the anterior temporal shield is scarcely longer than deep (modified from Hoser, 2018).

These snakes are further characterised by having 199-237 ventrals, 23-41 subcaudals, nuchal band covered by 14-20 vertebral scales; 19-31 black dorsal bands on the body, 2-7 dorsal bands on the tail and a yellow or whitish-cream background colour on the dorsum.

The six species are each separated from one another by the following unique suites of characters:

B. fasciatus has a yellow background colour, 22-31 dorsal bands on the body, 4-7 dorsal bands on the tail, dark yellow upper labials, boldly etched with black and a temporal formula of 1+2+3.

B. bifasciatus, *B. crotalusei* sp. nov. and *B. daranini* sp. nov. all have 19-21 dorsal bands on the body, (which alone separates them from *B. fasciatus*), a deep yellow background colour, 4-6 dorsal bands on the tail and a temporal formula of 1+2+3, 1+2+2, 2+2+3 or 2+2+2.

B. crotalusei sp. nov. is in turn separated from *B. bifasciatus* by having upper labials that are yellow in colour, but consistently dark edged at the anterior margins, versus the yellow of the upper labials being heavily peppered (rather than immaculate) in *B. bifasciatus* with the dark markings over the upper labials being in the form of distinctive dark patches in the form of rectangles or similar, rather than uniform etchings of the anterior of each scale. The subspecies *B. crotalusei peninsularenis* subsp. nov. is similar in most respects to *B. crotalusei* sp. nov. but instead of a deep yellow colour between the black bands on the dorsum, it has light yellow or cream interspaces on the dorsum, similar to that seen in *B. insularis* and *B. oxyi* sp. nov..

B. crotalusei peninsularenis subsp. nov. is further separated from *B. crotalusei* sp. nov. by having mainly black on the upper labials, including the inner parts of each and the lower parts, versus yellow and etched dark in *B. crotalusei* sp. nov., or with dark patches between yellow sections as seen in *B. bifasciatus*.

B. bifasciatus and *B. daranini* sp. nov. have a temporal formula of 1+2+2 or 2+2+2, versus 1+2+3 or 2+2+3 in *B. crotalusei* sp. nov. (and *B. crotalusei peninsularenis* subsp. nov.).

B. bifasciatus, *B. crotalusei* sp. nov. and *B. daranini* sp. nov. have 217-237 ventrals, that separates them from *B. insularis* which in turn has 199-210. *B. fasciatus* and *B. oxyi* sp. nov. are intermediate with 200-234 ventrals.

B. daranini sp. nov. is separated from both *B. bifasciatus* and *B. crotalusei* sp. nov. by having upper labials that are mainly yellow, with limited peppering on the surfaces and the dark etching forming downward pointing triangles running from the upper edge of the upper labials.

Both *B. daranini* sp. nov. and *B. bifasciatus* are separated from *B. crotalusei* sp. nov. by having dark cross bands on the dorsum being much wider than the intervening yellow, versus not so in *B. crotalusei* sp. nov..

B. daranini sp. nov. is also readily separated from both *B. bifasciatus* and *B. crotalusei* sp. nov. by having the dark cross-bands significantly curl in on the lower flanks, versus not so in the other two species.

B. insularis and *B. oxyi* sp. nov. are separated from the other four species in the genus (the genus as defined by Hoser 2018 and above), by having a washed out yellow or cream/yellow to whitish background colour, versus rich or dark yellow in the four mainland Asian species detailed above (except for the similarly light subspecies *B. crotalusei peninsularenis* subsp. nov.).

B. oxyi sp. nov. is in turn separated from *B. insularis* by having black bands on the dorsum of significantly narrower in width than the yellow background bands, versus the reverse situation in *B. insularis*, or bands of similar width in all other species in subspecies, except for *B. crotalusei peninsularenis* subsp. nov., which also has black bands wider than the lighter intervening areas (versus reverse in the otherwise morphologically similar *B. oxyi* sp. nov.).

In *B. oxyi* sp. nov. (and *B. crotalusei peninsularenis* subsp. nov.), the lower parts of the upper labials are generally dark in colour, versus generally light (cream) in *B. insularis*.

B. oxyi sp. nov. has a temporal formula of 1+2+2, versus 1+2+3 in *B. insularis*.

The detailed description of Taylor (1965) for Thai "*B. fasciatus*" from Chiang Mai, Chiang Mai Province, northern Thailand, on pages 944 and 945 is in fact of the species *B. crotalusei* sp. nov.. *B. fasciatus* is depicted online at:

<https://www.inaturalist.org/observations/69550594>

and

<https://www.inaturalist.org/observations/136658715>

and

<https://www.inaturalist.org/observations/59563338>

B. bifasciatus is depicted online at:

<https://www.flickr.com/photos/189071256@N05/50396259431/>

and

<https://www.inaturalist.org/observations/128112623>

and

<https://www.inaturalist.org/observations/155757022>

and

<https://www.inaturalist.org/observations/49354797>

B. crotalusei sp. nov. is depicted on page 944 of Taylor (1965) and online at:

<https://www.flickr.com/photos/98482848@N00/2247764883/>

and

<https://www.inaturalist.org/observations/142717704>

and

<https://www.inaturalist.org/observations/109511692>

and

<https://www.inaturalist.org/observations/64802846>

B. crotalusei peninsularenis subsp. nov. is depicted online at:

<https://www.inaturalist.org/observations/106616831>

and

<https://www.inaturalist.org/observations/96553489>

and

<https://www.inaturalist.org/observations/7655880>

B. daranini sp. nov. is depicted online at:

<https://www.inaturalist.org/observations/56005784>

and

<https://www.inaturalist.org/observations/127111416>

and

<https://www.inaturalist.org/observations/74749317>

and

<https://www.inaturalist.org/observations/101870376>

B. insularis is depicted online at:

<https://www.inaturalist.org/observations/101457607>

and

<https://www.inaturalist.org/observations/37187167>

and

<https://www.inaturalist.org/observations/67850292>

B. oxyi sp. nov. is depicted online at:

<https://www.inaturalist.org/observations/147167858>

and

<https://www.inaturalist.org/observations/42482785>

Distribution: *Bungarus daranini* sp. nov. appears to be confined to Mekong River drainage system, in the region from Yunnan, south-west China, in the north, through relevant parts of Myanmar (Burma), Laos, Thailand, Cambodia and Vietnam in the south.

Etymology: The species *Bungarus daranini* sp. nov. with a centre of distribution including most of Cambodia, is named in honour of Dara Nin of Ringwood, Victoria, Australia formerly working with Snakebusters, Australia's best reptiles, and more recently employed by the Victoria Police Force, in Melbourne, Victoria, Australia, in recognition for his services to herpetology over about a decade.

Dara Nin is of Cambodian background, although born in New Zealand and raised in Australia.

BUNGARUS OXYI SP. NOV.

LSIDDurn:lsid:zoobank.org:act:81FF0C54-E986-4428-8FC0-8D2D32191CE9

Holotype: A preserved specimen in the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA, specimen number MCZ Herp R-11264 collected from the Limbang River District, North Sarawak, Borneo, Malaysia.

This facility allows access to its holdings.

Paratypes: Two preserved specimens in the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA, specimen numbers MCZ Herp R-15248-15249, both collected from Baram, Sarawak, Borneo, Malaysia, and two more preserved specimens at the University Museum of Zoology Cambridge (Zoology), Cambridge, UK, specimen numbers: UMZC Vertebrates R9. 168/3 -168/4 both also collected from the Baram District, Sarawak, Borneo, Malaysia.

Diagnosis: The genus *Bungarus* Daudin, 1803, herein including the six species, *B. fasciatus* (Schneider, 1801), from east India, Bangladesh, Myanmar (Burma), Bhutan and Nepal, *B. bifasciatus* (Mell, 1929) from south China and nearby parts of north Vietnam and Laos, *B. insularis* (Mell, 1930) from Java, Bali, east Sumatra and southern Borneo, *B. crotalusei* sp. nov. from central and southern Thailand (and presumably also the lower Malay Peninsula, viz, Malaysia and Singapore), *B. daranini* sp. nov. from the Mekong River drainage basin, including relevant parts of Yunnan, China, Myanmar (Burma), Laos, Cambodia and southern Vietnam and *B. oxyi* sp. nov. from north-west Borneo (North Sarawak and Brunei) are separated from all other species in the tribe Bungarini Eichwald, 1831 by the following unique character suite: Subcaudals single; 15 or rarely 17 dorsal mid-body rows; a dorsal ridge formed by underlying spinous processes of the vertebrae manifesting as a row of enlarged scales along the mid-vertebral line; tail ends very obtusely, sometimes with a swollen tip; a large black mark on nape reaches to between the eyes and the anterior temporal shield is scarcely longer than deep (modified from Hoser, 2018).

These snakes are further characterised by having 199-237 ventrals, 23-41 subcaudals, nuchal band covered by 14-20 vertebral scales; 19-31 black dorsal bands on the body, 2-7 dorsal bands on the tail and a yellow or whitish-cream background colour on the dorsum.

The six species are each separated from one another by the following unique suites of characters:

B. fasciatus has a yellow background colour, 22-31 dorsal bands on the body, 4-7 dorsal bands on the tail, dark yellow upper labials, boldly etched with black and a temporal formula of 1+2+3.

B. bifasciatus, *B. crotalusei* sp. nov. and *B. daranini* sp. nov. all have 19-21 dorsal bands on the body, (which alone separates them from *B. fasciatus*), a deep yellow background colour, 4-6 dorsal bands on the tail and a temporal formula of 1+2+3, 1+2+2, 2+2+3 or 2+2+2.

B. crotalusei sp. nov. is in turn separated from *B. bifasciatus* by having upper labials that are yellow in colour, but consistently dark edged at the anterior margins, versus the yellow of the upper labials being heavily peppered (rather than immaculate) in *B. bifasciatus* with the dark markings over the upper labials being in the form of distinctive dark patches in the form of rectangles or similar, rather than uniform etchings of the anterior of each scale.

The subspecies *B. crotalusei peninsularenis* subsp. nov. is similar in most respects to *B. crotalusei* sp. nov. but instead of a deep yellow colour between the black bands on the dorsum, it has light yellow or cream interspaces on the dorsum, similar to that seen in *B. insularis* and *B. oxyi* sp. nov.

B. crotalusei peninsularenis subsp. nov. is further separated from *B. crotalusei* sp. nov. by having mainly black on the upper labials, including the inner parts of each and the lower parts, versus yellow and etched dark in *B. crotalusei* sp. nov., or with dark patches between yellow sections as seen in *B. bifasciatus*.

B. bifasciatus and *B. daranini* sp. nov. have a temporal formula of 1+2+2 or 2+2+2, versus 1+2+3 or 2+2+3 in *B. crotalusei* sp. nov. (and *B. crotalusei peninsularenis* subsp. nov.).

B. bifasciatus, *B. crotalusei* sp. nov. and *B. daranini* sp. nov. have 217-237 ventrals, that separates them from *B. insularis* which in turn has 199-210. *B. fasciatus* and *B. oxyi* sp. nov. are intermediate with 200-234 ventrals.

B. daranini sp. nov. is separated from both *B. bifasciatus* and *B. crotalusei* sp. nov. by having upper labials that are mainly yellow, with limited peppering on the surfaces and the dark etching forming downward pointing triangles running from the upper edge of the upper labials.

Both *B. daranini* sp. nov. and *B. bifasciatus* are separated from *B. crotalusei* sp. nov. by having dark cross bands on the dorsum being much wider than the intervening yellow, versus not so in *B. crotalusei* sp. nov.

B. daranini sp. nov. is also readily separated from both *B. bifasciatus* and *B. crotalusei* sp. nov. by having the dark cross-bands significantly curl in on the lower flanks, versus not so in the other two species.

B. insularis and *B. oxyi* sp. nov. are separated from the other four species in the genus (the genus as defined by Hoser 2018 and above), by having a washed out yellow or cream/yellow to whitish background colour, versus rich or dark yellow in the four mainland Asian species detailed above (except for the similarly light subspecies *B. crotalusei peninsularenis* subsp. nov.).

B. oxyi sp. nov. is in turn separated from *B. insularis* by having black bands on the dorsum of significantly narrower in width than the yellow background bands, versus the reverse situation in *B. insularis*, or bands of similar width in all other species in subspecies, except for *B. crotalusei peninsularenis* subsp. nov., which also has black bands wider than the lighter intervening areas (versus reverse in the otherwise morphologically similar *B. oxyi* sp. nov.).

In *B. oxyi* sp. nov. (and *B. crotalusei peninsularenis* subsp. nov.), the lower parts of the upper labials are generally dark in colour, versus generally light (cream) in *B. insularis*.

B. oxyi sp. nov. has a temporal formula of 1+2+2, versus 1+2+3 in *B. insularis*.

The detailed description of Taylor (1965) for Thai "*B. fasciatus*" from Chiang Mai, Chiang Mai Province, northern Thailand, on pages 944 and 945 is in fact of the species *B. crotalusei* sp. nov.. *B. fasciatus* is depicted online at:

<https://www.inaturalist.org/observations/69550594>
and

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B. bifasciatus is depicted online at:

<https://www.flickr.com/photos/189071256@N05/50396259431/>
and

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and

<https://www.inaturalist.org/observations/155757022>
and

<https://www.inaturalist.org/observations/49354797>

B. crotalusei sp. nov. is depicted on page 944 of Taylor (1965) and online at:

<https://www.flickr.com/photos/98482848@N00/2247764883/>
and

<https://www.inaturalist.org/observations/142717704>
and

<https://www.inaturalist.org/observations/109511692>
and

<https://www.inaturalist.org/observations/64802846>

B. crotalusei peninsularenensis subsp. nov. is depicted online at:

<https://www.inaturalist.org/observations/106616831>
and

<https://www.inaturalist.org/observations/96553489>
and

<https://www.inaturalist.org/observations/7655880>

B. daranini sp. nov. is depicted online at:

<https://www.inaturalist.org/observations/56005784>
and

<https://www.inaturalist.org/observations/127111416>
and

<https://www.inaturalist.org/observations/74749317>
and

<https://www.inaturalist.org/observations/101870376>

B. insularis is depicted online at:

<https://www.inaturalist.org/observations/101457607>
and

<https://www.inaturalist.org/observations/37187167>
and

<https://www.inaturalist.org/observations/67850292>

B. oxyi sp. nov. is depicted online at:

<https://www.inaturalist.org/observations/147167858>
and

<https://www.inaturalist.org/observations/42482785>

Distribution: *Bungarus oxyi* sp. nov. appears to be confined to the north-western parts of Borneo, generally in the vicinity of the Limbang and Baram River drainage systems.

Etymology: The species *Bungarus oxyi* sp. nov. is named in honour of a Great Dane dog, named "Oxyuranus", AKA Oxy, owned by myself in the period 2004 to 2012, in recognition of his role in guarding our research facility in Melbourne, Victoria, Australia from thieves. The spelling of the name "oxyi" is intentional and should not be altered unless mandated by governing rules.

BUNGARUS CROTALUSEI PENINSULARENENSIS SUBSP. NOV.
LSIDurn:lsid:zoobank.org:act:D1D20DB7-47CF-4AEA-A273-9DCF5D221D51

Holotype: A preserved specimen at the Amphibians and Reptiles collection of the Field Museum of Natural History, Chicago, Illinois, USA, specimen number FMNH 229812 collected from Johore, Malaysia.

This facility allows access to its holdings.

Paratypes: 1/ A preserved specimen at the Amphibians and Reptiles collection at the Natural History Museum of Denmark (SNM), Copenhagen, Denmark, specimen number ZMUC-R65298, collected from Malakka, Malaysia.

2/ A preserved specimen at the Amphibians and Reptiles collection at the Natural History Museum of Denmark (SNM), Copenhagen, Denmark, specimen number ZMUC-R65282 collected from Pulo Penang, Malaysia.

3/ A preserved specimen at the National Museum of Natural History, Smithsonian Institution, Washington, DC, USA, specimen number USNM Amphibians and Reptiles 142421 collected from Kuala Lumpur, Airport, Malaysia.

Diagnosis: The genus *Bungarus* Daudin, 1803, herein including the six species, *B. fasciatus* (Schneider, 1801), from east India, Bangladesh, Myanmar (Burma), Bhutan and Nepal, *B. bifasciatus* (Mell, 1929) from south China and nearby parts of north Vietnam and Laos, *B. insularis* (Mell, 1930) from Java, Bali, east Sumatra and southern Borneo, *B. crotalusei* sp. nov. from central and southern Thailand (and presumably also the lower Malay Peninsula, viz, Malaysia and Singapore), *B. daranini* sp. nov. from the Mekong River drainage basin, including relevant parts of Yunnan, China, Myanmar (Burma), Laos, Cambodia and southern Vietnam and *B. oxyi* sp. nov. from north-west Borneo (North Sarawak and Brunei) are separated from all other species in the tribe Bungarini Eichwald, 1831 by the following unique character suite: Subcaudals single; 15 or rarely 17 dorsal mid-body rows; a dorsal ridge formed by underlying spinous processes of the vertebrae manifesting as a row of enlarged scales along the mid-vertebral line; tail ends very obtusely, sometimes with a swollen tip; a large black mark on nape reaches to between the eyes and the anterior temporal shield is scarcely longer than deep (modified from Hoser, 2018).

These snakes are further characterised by having 199-237 ventrals, 23-41 subcaudals, nuchal band covered by 14-20 vertebral scales; 19-31 black dorsal bands on the body, 2-7 dorsal bands on the tail and a yellow or whitish-cream background colour on the dorsum.

The six species are each separated from one another by the following unique suites of characters:

B. fasciatus has a yellow background colour, 22-31 dorsal bands on the body, 4-7 dorsal bands on the tail, dark yellow upper labials, boldly etched with black and a temporal formula of 1+2+3.

B. bifasciatus, *B. crotalusei* sp. nov. and *B. daranini* sp. nov. all have 19-21 dorsal bands on the body, (which alone separates them from *B. fasciatus*), a deep yellow background colour, 4-6 dorsal bands on the tail and a temporal formula of 1+2+3, 1+2+2, 2+2+3 or 2+2+2.

B. crotalusei sp. nov. is in turn separated from *B. bifasciatus* by having upper labials that are yellow in colour, but consistently dark edged at the anterior margins, versus the yellow of the upper labials being heavily peppered (rather than immaculate) in *B. bifasciatus* with the dark markings over the upper labials being in the form of distinctive dark patches in the form of rectangles or similar, rather than uniform etchings of the anterior of each scale.

The subspecies *B. crotalusei peninsularenensis* subsp. nov. is similar in most respects to *B. crotalusei* sp. nov. but instead of a deep yellow colour between the black bands on the dorsum, it has light yellow or cream interspaces on the dorsum, similar to that seen in *B. insularis* and *B. oxyi* sp. nov..

B. crotalusei peninsularenensis subsp. nov. is further separated from *B. crotalusei* sp. nov. by having mainly black on the upper labials, including the inner parts of each and the lower parts, versus yellow and etched dark in *B. crotalusei* sp. nov., or with dark patches between yellow sections as seen in *B. bifasciatus*.

B. bifasciatus and *B. daranini* sp. nov. have a temporal formula of 1+2+2 or 2+2+2, versus 1+2+3 or 2+2+3 in *B. crotalusei* sp. nov. (and *B. crotalusei peninsularenensis* subsp. nov.).

B. bifasciatus, *B. crotalusei* sp. nov. and *B. daranini* sp. nov. have 217-237 ventrals, that separates them from *B. insularis* which in turn has 199-210. *B. fasciatus* and *B. oxyi* sp. nov. are intermediate with 200-234 ventrals.

B. daranini sp. nov. is separated from both *B. bifasciatus* and *B. crotalusei* sp. nov. by having upper labials that are mainly yellow, with limited peppering on the surfaces and the dark etching forming downward pointing triangles running from the upper edge of the upper labials.

Both *B. daranini* sp. nov. and *B. bifasciatus* are separated from *B. crotalusei* sp. nov. by having dark cross bands on the dorsum being much wider than the intervening yellow, versus not so in *B. crotalusei* sp. nov..

B. daranini sp. nov. is also readily separated from both *B. bifasciatus* and *B. crotalusei* sp. nov. by having the dark cross-bands significantly curl in on the lower flanks, versus not so in the other two species.

B. insularis and *B. oxyi* sp. nov. are separated from the other four species in the genus (the genus as defined by Hoser 2018 and above), by having a washed out yellow or cream/yellow to whitish background colour, versus rich or dark yellow in the four mainland Asian species detailed above (except for the similarly light subspecies *B. crotalusei peninsularensis* subsp. nov.).

B. oxyi sp. nov. is in turn separated from *B. insularis* by having black bands on the dorsum of significantly narrower in width than the yellow background bands, versus the reverse situation in *B. insularis*, or bands of similar width in all other species in subspecies, except for *B. crotalusei peninsularensis* subsp. nov., which also has black bands wider than the lighter intervening areas (versus reverse in the otherwise morphologically similar *B. oxyi* sp. nov.).

In *B. oxyi* sp. nov. (and *B. crotalusei peninsularensis* subsp. nov.), the lower parts of the upper labials are generally dark in colour, versus generally light (cream) in *B. insularis*.

B. oxyi sp. nov. has a temporal formula of 1+2+2, versus 1+2+3 in *B. insularis*.

The detailed description of Taylor (1965) for Thai "*B. fasciatus*" from Chiang Mai, Chiang Mai Province, northern Thailand, on pages 944 and 945 is in fact of the species *B. crotalusei* sp. nov.. *B. fasciatus* is depicted online at:

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and

<https://www.inaturalist.org/observations/59563338>

B. bifasciatus is depicted online at:

<https://www.flickr.com/photos/189071256@N05/50396259431/>

and

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<https://www.inaturalist.org/observations/155757022>

and

<https://www.inaturalist.org/observations/49354797>

B. crotalusei sp. nov. is depicted on page 944 of Taylor (1965) and online at:

<https://www.flickr.com/photos/98482848@N00/2247764883/>

and

<https://www.inaturalist.org/observations/142717704>

and

<https://www.inaturalist.org/observations/109511692>

and

<https://www.inaturalist.org/observations/64802846>

B. crotalusei peninsularensis subsp. nov. is depicted online at:

<https://www.inaturalist.org/observations/106616831>

and

<https://www.inaturalist.org/observations/96553489>

and

<https://www.inaturalist.org/observations/7655880>

B. daranini sp. nov. is depicted online at:

<https://www.inaturalist.org/observations/56005784>

and

<https://www.inaturalist.org/observations/127111416>

and

<https://www.inaturalist.org/observations/74749317>

and

<https://www.inaturalist.org/observations/101870376>

B. insularis is depicted online at:

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<https://www.inaturalist.org/observations/37187167>

and

<https://www.inaturalist.org/observations/67850292>

B. oxyi sp. nov. is depicted online at:

<https://www.inaturalist.org/observations/147167858>

and

<https://www.inaturalist.org/observations/42482785>

Distribution: *Bungarus crotalusei peninsularensis suboxyi* sp. nov. appears to be confined to the Malay Peninsular, south of the Isthmus of Kra, all the way to Singapore in the far south.

Etymology: The subspecies *Bungarus crotalusei peninsularensis subsp. nov.* is named in reflection of where it occurs, being the lower Malay Peninsular.

CONSERVATION THREATS TO BUNGARUS CROTALUSEI SP. NOV., B. DARANINI SP. NOV. AND B. OXYI SP. NOV.

There are no known significant immediate conservation threats to the newly named species, although the best part of the habitat for these taxa have been effectively erased by the creation of endless expanses rice paddies, palm oil plantations or other forms of intensive human farming, with riverine habitats generally degraded by intense human settlement and activities.

Unforeseen threats may include direct human activities (e.g. yet more land clearing for homes or farming activities), as well as potential threats caused by changed vegetation regimes, introduced pests and potential pathogens, including those introduced via the legal importation of foreign reptiles and amphibians by government-owned zoos and other government backed commercial enterprises.

Denial of the existence of the relevant taxa *sensu* Wüster *et al.* as outlined by Hoser (2019a, 2019b), could ultimately cause extinction of these taxa in the same way it caused one or more earlier extinctions as documented by Hoser (2019a, 2019b), (see also Mitchell (1948) and Peters (1863)).

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CONFLICTS OF INTEREST

None.