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# A sensible breakup of the genus *Bungarus* Daudin, 1803 sensu lato and the description of a new species.

## **RAYMOND T. HOSER**

488 Park Road, Park Orchards, Victoria, 3134, Australia.

Phone: +61 3 9812 3322 Fax: 9812 3355 E-mail: snakeman (at) snakeman.com.au
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## **ABSTRACT**

The genus *Bungarus* Daudin, 1803 has been found in molecular studies to be an ancient assemblage of morphologically similar snakes (e.g. Pyron *et al.* 2011, 2013). However in recent years herpetologists have persisted in assigning all species to the genus *Bungarus* even though there are available names for the two most divergent species groups.

To correct this situation, the genera *Megaerophis* Gray, 1849 and *Xenurelaps* Günther, 1864 are resurrected from synonymy. *Bungarus* is confined to the core group, currently referred to as *B. fasciatus* (as one species only by most authors, but herein conservatively treated as three subspecies, following on from Laopichienpong *et al.* 2016). All have available names.

Another group comprising several species is herein placed into the resurrected genus *Aspidoclonion* Wagler, 1828. This has the type species *Aspidoclonion semifasciatum* Wagler, 1828, which is now known as *Bungarus candidus* (Linnaeus, 1758).

This in effect means *Bungarus* is split into four genera and these in turn remain within the tribe Bungarini Eichwald, 1831, as defined by Hoser (2012).

A new species previously grouped with *B. multicinctus* Blyth, 1861 or *B. wanghaotingi* Pope, 1928 (now in the genus *Aspidoclonion*) is formally named for the first time.

The species currently known as the Red-headed Krait, *Bungarus flaviceps* Reinhardt, 1843, (now placed in *Megaerophis*) is herein divided into four allopatric subspecies, two of which are formally named for the first time.

**Keywords:** Taxonomy; Bungarini; snakes; Asia; south-east Asia; Burma; Thailand; Malaysia; Sumatra; Java; Borneo; Indonesia; China; Kraits; *Bungarus*; *Megaerophis*; *Xenurelaps*; *Aspidoclonion*; *fasciatus*; *insularis*; *bifasciatus*; *multicinctus*; *wanghaotingi*; new species; *sloppi*; new subspecies; *promontoriumrursus*; *masalbidus*.

## INTRODUCTION

The genus *Bungarus* Daudin, 1803 are better known as the Kraits. These are highly venomous elapid snakes with a centre of distribution in south-east Asia (Sundaland), including western Indonesia, Indo-China and nearby areas such as Bangladesh and southern China.

In the period post-dating 1990, using new technology, molecular studies have found that the genus *Bungarus* as currently recognized by most practicing herpetologists comprises an ancient assemblage of morphologically similar snakes (e.g. Pyron *et al.* 2011, 2013).

Notwithstanding the deep divergences between species groups, herpetologists have until now persisted in assigning all species to the genus *Bungarus*.

There are however available names for the two most divergent species groups.

These are the genera *Megaerophis* Gray, 1849, type species *Megaerophis formosus* Gray, 1849 (now treated as a synonym of the species currently known as *Bungarus flaviceps* Reinhardt, 1943) and *Xenurelaps* Günther, 1864, type species *Elaps bungaroides* Cantor, 1839, which is also currently placed in the genus *Bungarus*.

In light of the above facts, it became clear that a paper needed to be published giving the genus *Bungarus sensu lato* an overhaul to reflect known phylogeny, even if it merely meant the resurrection of names for well-defined genus groups.

To that end and in order to resolve other potential issues, the entire genus *Bungarus sensu lato* which forms the tribe Bungarini Eichwald, 1831, as defined by Hoser (2012) was

audited to see if there were other unnamed genus level groupings, or obviously unnamed species.

It became clear that the species diversity reflected in the literature was an underestimation of the reality.

An audit of all currently recognized and named species was performed by way of review of the literature, relevant type specimens as described and specimens from across the range of all known species to form the basis of the final classification within this paper.

To that end, the following arrangement has been adopted. Bungarus is confined to the core group, currently referred to as B. fasciatus only by most authors, but herein treated as three subspecies (following on from Laopichienpong et al. 2016). All have available names and so two (B. bifasciatus Mell, 1929 and B. insularis Mell, 1930) are resurrected from synonymy as

Another group comprising several species is herein placed into a the resurrected genus *Aspidoclonion* Wagler, 1828. This in effect means *Bungarus* is split into four genera and these in turn remain within the tribe Bungarini Eichwald, 1831, as defined by Hoser (2012).

A new species previously grouped with *B. multicinctus* Blyth, 1861 or *B. wanghaotingi* Pope 1928 (now in the genus *Aspidoclonion*) from Myanmar (formerly Burma) is formally named for the first time.

The species currently known as *Bungarus flaviceps* Reinhardt, 1843, (now placed in *Megaerophis*) is herein divided into four allopatric subspecies, two of which are also formally named for the first time.

#### **MATERIALS AND METHODS**

These are not formally explained in a number of my recent papers under the heading "Materials and methods" or similar, on the basis they are self evident to any vaguely perceptive reader. However, the process by which the following taxonomy and nomenclature in this and other recent papers by myself of similar form (in *Australasian Journal of Herpetology* issues 1-36), has been arrived at, is explained herein for the benefit of people who have recently published so-called "criticisms" online of some of my recent papers. They have alleged a serious "defect" by myself not formally explaining "Materials and Methods" under such a heading.

The process involved in creating the final product for this and other relevant papers has been via a combination of the following:

Genera and component species have been audited to see if their classifications are correct on the basis of known type specimens, locations and the like when compared with known phylogenies and obvious morphological differences between relevant specimens and similar putative species.

Original descriptions and contemporary concepts of the species are matched with available specimens from across the ranges of the species to see if all conform to accepted norms.

These may include those held in museums, private collections, collected in the field, photographed, posted on the internet in various locations or held by individuals, and only when the location data is good and any other relevant and verifiable data is available.

Where specimens do not appear to comply with the described species or genera (and accepted concept of each), this non-conformation is looked at with a view to ascertaining if it is worthy of taxonomic recognition or other relevant considerations on the basis of differences that can be tested for antiquity or deduced from earlier studies.

When this appears to be the case (non-conformation), the potential target taxon is inspected as closely as practicable with a view to comparing with the nominate form or forms if other similar taxa have been previously named.

Other relevant data is also reviewed, including any available molecular studies which may indicate likely divergence of populations.

Where molecular studies are unavailable for the relevant taxon or group, other studies involving species and groups constrained by the same geographical or geological barriers, or with like distribution patterns are inspected as they give reasonable indications of the likely divergences of the taxa being studied herein

Additionally other studies involving geological history, sea level and habitat changes associated with long-term climate change, including recent ice age changes in sea levels, versus known sea depths are utilized to predict past movements of species and genus groups in order to further ascertain likely divergences between extant populations (as done in this very paper), while also assessing likely habitat boundaries for given populations.

When all available information checks out to show taxonomically distinct populations worthy of recognition, they are then recognized herein according to the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

This means that if a name has been properly proposed in the past (even if in the absence of sound scientific data), it is used as is done in this paper. Alternatively, if no name is available, one is proposed according to the rules of the Code as is done in this paper.

As a matter of trite I mention that if a target taxon or group does check out as being "in order" or properly classified, a paper is usually not published unless some other related taxon is named for the first time.

The published literature relevant to *Bungarus sensu lato* and the taxonomic and nomenclatural judgements made within this paper

includes the following: Abtin et al. (2014). Ahsan and Rahman (2017), Ali et al. (2016), Anderson (1871), Anwar (2011), Auliya (2006), Avadhani (2005), Baig et al. (2008), Bannerman (1905), Bauer (1998), Bauer and Günther (1992), Bhattarai et al. (2017), Bhupathy and Sathishkumar (2013), Biswas and Sanyal (1978), Blyth (1856, 1861), Botejue et al. (2012), Boulenger (1890, 1896, 1897), Brongersma (1948), Buden and Taboroši (2016), Cantor (1839), Castoe et al. (2007), Chan-ard et al. (1999, 2015), Chandramouli (2011), Chettri and Chettri (2013), Cholmondeley (1908), Cox et al. (1998), Das (2012), Das and Chaturvedi (1998), Das and De Silva (2005), Das and Palden (2000), Das et al. (2009), David and Vogel (1996), Deraniyagala (1955), Deshmukh et al. (2016), De Silva (1998), Dowling and Jenner (1988), Dravidamani et al. (2006), Duméril et al. (1854), Eichwald (1831), Evans (1905), Fellows (2015), Ganesh and Arumugam (2016), Ganesh and Gawor et al. (2016), Geissler et al. (2011), Glass (1946), Golay (1985), Grandison (1972), Gray (1849), Grismer (2011), Grismer et al. (2008a, 2008b, 2010), Grosselet et al. (2004). Grossmann (1990). Grossmann and Schäfer (2000). Gumprecht (2003), Günther (1858, 1864, 1888), Hecht et al. (2013), Hien et al. (2001), Hoser (2012), Iskandar and Mumpuni (2002), Janzen et al. (2007), Jayaneththi (2015), Jestrzemski (2016), Jestrzemski et al. (2013), Jiang et al. (2011), Kandamby (1997), Karns et al. (2015), Ka"stle et al. (2013), Khan (1985, 1986, 2002), Kharin et al. (2011), Kinnear (1913), Knierim et. al. (2017), Kopstein (1932, 1936a, 1936b, 1938), Kral (1969), Kramer (1977), Kuch (1996, 2001, 2002, 2004), Kuch and Götzke (2000), Kuch and Mebs (2007), Kuch and Schneyder (1991, 1992, 1993, 1996), Kuch and Tillack (2004), Kuch et al. (2005), Kundu et al. (2016), Kyi and Zug (2003), Lang and Vogel (2015), Laopichienpong et al. (2016), Lenz (2012), Leviton et al. (2003), Linnaeus (1758), LiVigni (2013), Loveridge (1938), Mahony et al. (2009), Malkmus et al. (2002), Manthey (1983), Manthey and Grossmann (1997), Martin (1913), Masroor (2012), Mattison (2007), Mirza (2012), Mohapatra (2011), Murthy (2010), Nath et al. (2011), Onn et al. (2009), Orlov et al. (2003a, 2003b), Palot (2015), Pauwels et al. (2003), Pillay (1904), Pitman (1913), Pope (1928), Purkayastha et al. (2011), Pyron et al. (2011, 2013a, 2013b), Rahman et al. (2013), Rao and Zhao (2004), Rasmussen and Hughes (1996), Reinhardt (1843), Ride et al. (1999), Roemer and Mahyar-Roemer (2006), Rooijen and Rooijen (2002, 2007), Russell (1796), Saint Girons (1972), Sang et al. (2009), Schneider (1801), Schultz and Slegers (1985), Sclater (1891), Seung Hoon (2012), Shah (1998, 1999), Sharma (2004), Sharma et al. (2013), Singh et al. (1979), Siow and Figueroa (2016), Slowinski (1994), Smith (1913, 1914, 1943), Srinivasulu et al. (2009), Steineger (1908, 1910), Stuart et al. (2006), Stuebing and Inger (1999), Switak (2006), Sworder (1933), Taylor (1953, 1965), Teynié et al. (2010), Thakur (2011), Theophilus et al. (2008), Thompson and Thompson (2008), Tillack (2003), Tillack and Grossmann (2001), Tillack and Kucharzewski (2004), Tsetan and Ramanibai (2011), Tweedie (1950, 1954), Vogel (2006), Vogel and Hoffmann (1997), Voris (2006), Vyas (1998, 2007, 2009, 2011, 2013, 2014), Wall (1905, 1906, 1907a, 1907b, 1908, 1909, 1911, 1913a, 1913b), Wall and Evans (1900, 1901), Wallach et al. (2014), Werning (2006), Whittaker and Captain (2004), Willey (1906), Zeeb (2012), Zhao (2006), Zhao and Adler (1993), Ziegler (2002), Ziegler et al. (2007, 2015) and sources cited therein.

Some material within descriptions below may be repeated for different described taxa and this is in accordance with the provisions of the *International Code of Zoological Nomenclature* and the legal requirements for each description. I make no apologies for this.

I also note that, notwithstanding the theft of relevant materials from this author in an illegal armed raid on 17 August 2011, which were not returned in breach of undertakings to the court (Court of Appeal Victoria 2014 and VCAT 2015), I have made a decision to publish this paper.

This is in view of the conservation significance attached to the formal recognition of unnamed taxa at all levels and on the basis that further delays may in fact put these presently unnamed or

potentially improperly assigned taxa at greater risk of extinction.

This comment is made noting the extensive increase in human population in south-east Asia and elsewhere and the general environmental destruction across that continent as documented by Hoser (1991), including low density areas without a large permanent human population. These areas still remain heavily impacted by non-residential human activities.

I also note the abysmal environmental record of various National, State and Local governments in the region the past 200 years as detailed by Hoser (1989, 1991, 1993 and 1996).

# NOTES ON THE DESCRIPTIONS FOR ANY POTENTIAL REVISORS

Unless mandated by the rules of the *International Code of Zoological Nomenclature*, none of the spellings of the newly proposed names should be altered in any way. Should one or more newly named taxa be merged by later authors to be treated as a single species or subspecies, the order of priority of retention of names should be the order (page priority) of the descriptions within this text.

## TRIBE BUNGARINI EICHWALD, 1831.

(Terminal taxon: Bungarus annularis Daudin, 1803)

**Diagnosis:** The elapid snakes in this tribe are readily separated from all other species and genera of elapid by the following suites of characters:

- 1/ The maxillary bone is without a posterior process and there is no isolated anterior mandibular tooth and:
- 2/ The maxillary bone does not extend forward beyond the palatine and the vertebral scales are enlarged.

The four genera within this tribe are separated from one another by the following four suites of characters:

1/ Subcaudals single; 15 or rarely 17 dorsal mid-body rows; a dorsal ridge; tail ends very obtusely and the anterior temporal shield is scarcely longer than deep, (Genus *Bungarus* Daudin, 1803), or:

2/ Subcaudals single; 15 or rarely 17 dorsal mid-body rows; no dorsal ridge; tail tapers to a point; anterior temporal is much longer than deep (Genus *Aspidoclonion* Wagler, 1828), or:

3/ Subcaudals divided or partly single and partly divided. 13 midbody rows (Genus *Megaerophis* Gray, 1849), or:

4/ Subcaudals divided or partly single and partly divided. 15 midbody rows (Genus *Xenurelaps* Günther, 1864).

Distribution: South-east Asia.

Content: Bungarus Daudin, 1803 (Type genus); Aspidoclonion Wagler, 1828; Megaerophis Gray, 1849; Xenurelaps Günther, 1864.

### GENUS BUNGARUS DAUDIN, 1803.

**Type species:** *Bungarus annularis* Daudin, 1803 (now known as *B. fasciatus* (Schneider, 1801).

**Diagnosis:** The genus *Bungarus* Daudin, 1803 is separated from all other species in the tribe Bungarini Eichwald, 1831by the following characters: Subcaudals single; 15 or rarely 17 dorsal mid-body rows; a dorsal ridge; tail ends very obtusely and the anterior temporal shield is scarcely longer than deep.

**Distribution:** From India, through south-east Asia to Indonesia and as far east on the mainland of Asia to southern China.

**Content:** *B. fasciatus* (Schneider, 1801) (including three subspecies).

## GENUS ASPIDOCLONION WAGLER, 1828.

**Type species:** Aspidoclonion semifasciatum Wagler, 1828 (currently known as *Bungarus candidus* (Linnaeus, 1758).

**Diagnosis:** The genus *Aspidoclonion* Wagler, 1828 is separated from all other species in the tribe Bungarini Eichwald, 1831 by the following characters: Subcaudals single; 15 or rarely 17 dorsal mid-body rows; no dorsal ridge; tail tapers to a point; anterior temporal is much longer than deep.

**Distribution:** From India, through south-east Asia to Indonesia and as far east on the mainland of Asia to southern China.

Content: A. candidus (Linnaeus, 1758) (Type species); A. andamanensis (Biswas and Sanyal, 1978);

A. caeruleus (Schneider, 1801); A. ceylonicus (Günther, 1864); A. lividus (Cantor, 1839); A. magnimaculatus (Wall and Evans, 1901); A. multicinctus (Blyth, 1861); A. niger (Wall 1908); A. persicus (Abtin, Nilson, Mobaraki, Hooseini and Dehgannejhad, 2014); A. sindanus (Boulenger, 1897); A. sloppi sp. nov. (this paper); A. walli (Wall, 1907); A. wanghaotingi (Pope, 1928).

#### GENUS MEGAEROPHIS GRAY, 1849.

Type species: Megaerophis formosus Gray, 1849, (Currently known as Bungarus flaviceps Reinhardt, 1843).

**Diagnosis:** The genus *Megaerophis* Gray, 1849 is separated from all other species in the tribe Bungarini Eichwald, 1831 by the following characters: Subcaudals divided or partly single and partly divided; 13 dorsal mid-body rows.

**Distribution:** South-east Asia from Myanmar (formerly Burma) to

Content: Megaerophis flaviceps (Reinhardt, 1843) (including four subspecies).

#### GENUS XENURELAPS GÜNTHER, 1864.

**Type species:** *Xenurelaps bungaroides* Günther 1864, (Currently known as *Bungarus bungaroides* (Cantor, 1839)). **Diagnosis:** The genus *Xenurelaps* Günther 1864 is separated from all other species in the tribe Bungarini Eichwald, 1831 by the following characters: Subcaudals divided or partly single and partly divided; 15 dorsal mid-body rows.

**Distribution:** Known only from the southern Himalayas (*Xenurelaps bungaroides* (Cantor, 1839)) and nearby parts of northern Vietnam (*X. slowinskii* (Kuch, Kizirian, Nguyen, Lawson, Donnelly and Mebs, 2005)).

**Content:** Xenurelaps bungaroides (Cantor, 1839) (Type species); X. slowinskii (Kuch, Kizirian, Nguyen, Lawson, Donnelly and Mebs, 2005).

## ASPIDOCLONION SLOPPI SP. NOV.

**Holotype:** An adult male preserved specimen at the California Academy of Science (CAS), USA, specimen number HERP 216419 listed as a "*Bungarus multicinctus*" collected from the Road between Ye Gyi and Gwa Town, Rakhine State, Myanmar (formerly Burma), Latitude 17.56 N; Longitude 94.74 E.

The California Academy of Science (CAS) is a facility that allows access to its holdings by scientists.

Paratype: An adult male preserved specimen at the California Academy of Science (CAS) specimen number HERP 210204 listed as a "Bungarus multicinctus" collected from Alaungdaw Kathapa National Park, Sunthaik Chaung (tributary to Hkaungdin Chaung), Sagaing Div. Myanmar (formerly Burma), Latitude 22.31 N; Longitude 94.41 E.

**Diagnosis:** Aspidoclonion sloppi sp. nov. has been treated until now as either "Bungarus multicinctus Blyth, 1861" or the similar "B. wanghaotingi (Pope, 1928)". Both those taxa are now also herein placed within the genus Aspidoclonion Wagler, 1828.

The species A. wanghaotingi (Pope, 1928), has until now been placed by most authors in synonymy with A. multicinctus.

A. candidus (Linnaeus, 1758) and A. multicinctus are readily separated from all others in the genus Aspidoclonion by having a frontal that is longer than broad, a rostral considerably broader than deep and obvious strongly enlarged vertebral scales.

Both are characterised by a pattern of alternating dark and light dorsal cross-bands.

A. multicinctus is separated from A. candidus by having more numerous (42-60) darker bands with correspondingly narrower light interspaces (on body and tail), versus less than 40 darker bands in A. candidus (on body and tail) and light and dark bands of similar width.

A. multicinctus is separated from the similar A. wanghaotingi by the higher number of light cross bands on the body and tail (this is 31-40 on the body and 9-17 on the tail in A. multicinctus, 20-31 and 7-11 respectively in A. wanghaotingi).

Both *A. multicinctus* type locality from Xiamen (= Amoy), China and *A. wanghaotingi* type locality Yuankiang, China are different species and form to *Aspidoclonion sloppi sp. nov*. from Myanmar.

Aspidoclonion sloppi sp. nov. is separated from both A. multicinctus and A. wanghaotingi by the following suite of characters: an absence of a large well-defined white cross-band on the upper nape, the dorsal white crossbands are of an immaculate white colour without any greyish or black flecks on the flanks, except the far lower flanks, versus obvious black or grey specking on the upper and mid flanks on the white bands in both A. multicinctus and A. wanghaotingi.

The tail of both *A. multicinctus* and *A. wanghaotingi* are characterised by well-defined circular white rings, alternating with slightly wider black ones, versus ill-defined often irregularly shaped whitish rings on the tail in *A. sloppi sp. nov.*.

Significantly in both *A. multicinctus* and *A. wanghaotingi* the darker dorsal crossbands do for the entire length of the body run to the venter. In most if not all specimens of *A. sloppi sp. nov.* this is not the case for the darker cross-bands on the anterior half of the body. Instead they terminate on the lower flanks and are bounded by white, which in turn merges with the narrow light cross bands. This in effect makes the anterior darker dorsal cross-bands a pattern of enlarged ovoid rectangles divided by areas of white pigment.

A. sloppi sp. nov. is further separated by presence of whitish upper labials forming a distinctive yellow border line along the lower flank of the anterior of the snake to the first darker crossband, which in this species (unlike the others) are formed into large dark blotches across the upper body, bounded by white on the lower flanks.

#### **Additional Comments:**

There are numerous photos of *A. sloppi sp. nov.* on the internet and elsewhere invariably misidentified as something else. Most are misidentified as *A. multicinctus* or less often *A. wanghaotingi.* I note that there is a book called "The Snake Charmer", by Jamie James (James 2008), which details the life and times of Joe Slowinski and how he died from the bite of a "Many Banded Krait" in Burma. There is no doubt that the species responsible for the bite was in fact *A. sloppi sp. nov.*.

However in terms of responsibility for the fatal bite and the death, there is absolutely no doubt that full blame and responsibility must rest with Joe Slowinski himself. The book by James, details Slowinski's lifetime of abusing and attacking snakes with brutal metal tongs, as depicted throughout the book (see for example the colour plate of Slowinski with tongs opposite page 181), or 5 pages earlier where there are two photos in succession of Slowinski attacking snakes with the very same tongs.

These barbaric devices are sold as snake handling tools, to allow people to grab snakes without use of hands and are therefore touted as a safety device. They do in fact break the snakes bones and internal organs and turn otherwise innocuous animals into crazy killing machines, crazed by the extreme and usually life-threatening pain and injuries sustained by the snake.

James (2008) even has a photo of Slowinski with a Many Banded Krait (in this case *A. sloppi sp. nov.*) with its neck clamped between the claws of a set of tongs in a pose which clearly shows Slowinski improperly inflicting life threatening injuries on the snake.

The same photo shows Brady Barr with a similar set of tongs in his hand, while below that is yet another image of a snake about to have its bones broken by a set of tongs.

While animal cruelty laws may not have existed in Burma at the time the photo was taken, such handling of a snake (likely to cause its injury or death) would be the sort of activity liable to lead to a prosecution for animal cruelty in a country such as the United States of America or Australia.

James (2008) is in effect a book that attempts to rewrite history and to describe the death of Slowinski by snakebite in Burma as some kind of extremely unfortunate event, for which the snake must be blamed. Slowinski is painted as some kind of hero. In

fact nothing could be further from the truth.

By simple inspection of the images presented in the book, it is self-evident that Slowinski was a man who for some years had traded on committing acts of animal abuse and cruelty, through his mainly illegal use of metal tongs.

Anyone who attacks, torments and injures wildlife in breach of all civilized laws and protocols, deserves the inevitable consequences of their activity and blame shifting should not be employed.

The story of Slowinski (never known to me while he lived, I might add) is no different to that of the Late Steve Irwin. In the latter case, we had a police-protected criminal who scammed a fortune making TV shows displaying on camera acts of animal abuse and cruelty. After Steve Irwin died doing what he did best, that was illegally tormenting and abusing wildlife, in this case a Stingray, which took umbrage at his actions, his family and business did not do the honest thing and blame their man for the death arsing from Irwin's assault on the animal. Instead the Stingray was blamed, his followers went out and killed a few more and history was rewritten by the Irwin's business to falsely paint that man as some sort of wildlife conservation icon, which in fact he never was.

**Distribution:** Hiller parts of the western half of Myanmar (Burma).

**Etymology:** Named in honour of the Great Dane pet at the Hoser family household, named "Slopp" in recognition of his work in protecting the Hoser research facility and free of thefts by others employed or acting on behalf of others who would seek to steal what is not theirs.

At the time this paper was written in 2017, Slopp was 5 years old. I have no hesitation in naming a species in honour of a non-human inhabitant of this planet.

## **MEGAEROPHIS FLAVICEPS (REINHARDT, 1843)**

Holotype: ZMUC R65301, from Java, Indonesia.

**Diagnosis:** The species currently known as *Bungarus flaviceps* Reinhardt, 1843, (now placed in *Megaerophis*) is herein divided into four allopatric subspecies, two of which are also formally named for the first time.

This species is separated from all others in the tribe by having subcaudals divided or partly single and partly divided and 13 dorsal mid-body rows.

It is further diagnosed by the following suite of characters: expanded neural crest of vertebrae forms distinct ridge down the back and tail; subcaudals undivided, although anteriorly those near the tip may be divided; ventrals: males 193-236, females 193-217; subcaudals: males 47-53, females 42-54. Black above; orange-yellow dorsal stripe often present; interstitial skin orange-yellow giving appearance of longitudinal stripes; head reddish to orange-yellow; tail and posterior part of body reddish to orange-yellow; belly orange, yellow, brown or whitish, sometimes edged with brown. (modified from Smith, 1943 at p. 411.).

The nominate subspecies *Megaerophis flaviceps flaviceps* Reinhardt, 1843 is separated from the other three subspecies by having less than 200 ventrals, versus over 200 in all other subspecies.

All of *M. flaviceps flaviceps* Reinhardt, 1843, *M. flaviceps promontoriumrursus subsp. nov.* from Peninsula Malaysia and Thailand, and *M. flaviceps masalbidus subsp. nov.* from northern Sumatra are characterised by a dorsal colouration of greyish black in colour and with a very distinctive orange to red head and tail and no overtly obvious body pattern or dorsal streak.

Both *M. flaviceps flaviceps* Reinhardt, 1843 and *M. flaviceps promontoriumrursus subsp. nov.* from Peninsula Malaysia and Thailand are characterised by a series of small yellow dots along the vertebral line, a yellow lateral streak along the two outer rows of scales a red tail and an elongate black marking on the back of the head. *M. flaviceps flaviceps* Reinhardt, 1843 has a yellowish or brown belly, versus whitish in *M. flaviceps promontoriumrursus subsp. nov.*.

The subspecies M. flaviceps formosus (Grav. 1849) from the northern parts of Borneo, is easily the most divergent subspecies in terms of dorsal colouration, characterised by irregular white, red and black crossbands (that are absent in other subspecies) as well as a distinctive yellow vertebral line.

The more recent name "Bungarus flaviceps baluensis Loveridge, 1938", widely appearing in the literature (e.g. Manthey 1983 and Sang et al. 2009) is a junior synonym of the Gray name.

M. flaviceps formosus is further characterised by usually having the first and second labial merged to form one larger one.

M. flaviceps promontoriumrursus subsp. nov. from Peninsula Malaysia and Thailand are further separated from the other three subspecies by the presence of a wide squarish border on the second upper labial as well as a generally whitish belly.

M. flaviceps masalbidus subsp. nov. from northern Sumatra are separated from the other three subspecies by the combination of the following characters: a high ventral count (over 215 in both sexes), more or less triangular second upper labial and a generally whitish belly.

Only M. flaviceps formosus has a similar ventral count and that taxon from Borneo can be readily separated from M. flaviceps masalbidus subsp. nov. by the radically different dorsal colour

Distribution: Java, Indonesia.

### MEGAEROPHIS FLAVICEPS FORMOSUS (GRAY, 1849).

Holotype: Two specimens in the British Museum of Natural History, UK (BMNH) from Sarawak, Borneo.

Diagnosis: See the description above for Bungarus flaviceps

Reinhardt, 1843.

Distribution: Known only from Borneo, this being only the hillier

northern parts.

#### MEGAEROPHIS FLAVICEPS PROMONTORIUMRURSUS SUBSP. NOV.

Holotype: A preserved specimen in the Museum of Natural History (UK) BMNH specimen number: 1860.3.19.1263 collected from Pinang (Penang), Peninsular Malaysia. The Museum of Natural History in London, UK allows access to its holdings.

Paratypes: Three preserved specimens in the Museum of Natural History (UK) BMNH specimen numbers: BMNH 1987.1148 collected from Surat Thani, Thailand; BMNH 1938.8.7.59 collected from Khao Ram, Nakousatamera Mts, (Siam) Thailand; BMNH 1969.1924 collected from Betong, Patani, Province, Thailand.

Diagnosis: The species currently known as Bungarus flaviceps Reinhardt, 1843, (now placed in Megaerophis) is herein divided into four allopatric subspecies, two of which are also formally named for the first time.

This species is separated from all others in the tribe by having subcaudals divided or partly single and partly divided and 13 dorsal mid-body rows.

It is further diagnosed by the following suite of characters: expanded neural crest of vertebrae forms distinct ridge down the back and tail; subcaudals undivided, although anteriorly those near the tip may be divided; ventrals: males 193-236, females 193-217; subcaudals: males 47-53, females 42-54. Black above; orange-yellow dorsal stripe often present; interstitial skin orangeyellow giving appearance of longitudinal stripes; head reddish to orange-yellow; tail and posterior part of body reddish to orangeyellow; belly orange, yellow, brown or whitish, sometimes edged with brown. (modified from Smith, 1943 at p. 411.).

The nominate subspecies Megaerophis flaviceps flaviceps Reinhardt, 1843 is separated from the other three subspecies by having less than 200 ventrals, versus over 200 in all other

All of M. flaviceps flaviceps Reinhardt, 1843, M. flaviceps promontoriumrursus subsp. nov. from Peninsula Malaysia and Thailand, and M. flaviceps masalbidus subsp. nov. from northern Sumatra are characterised by a dorsal colouration of greyish

black in colour and with a very distinctive orange to red head and tail and no overtly obvious body pattern or dorsal streak.

Both M. flaviceps Reinhardt, 1843 and M. flaviceps promontorium rursus subsp. nov. from Peninsula Malaysia and Thailand are characterised by a series of small yellow dots along the vertebral line, a yellow lateral streak along the two outer rows of scales a red tail and an elongate black marking on the back of

M. flaviceps flaviceps Reinhardt, 1843 has a yellowish or brown belly, versus whitish in M. flaviceps promontoriumrursus subsp.

The subspecies M. flaviceps formosus (Gray, 1849) from the northern parts of Borneo, is easily the most divergent subspecies in terms of dorsal colouration, characterised by irregular white, red and black crossbands (that are absent in other subspecies) as well as a distinctive yellow vertebral line.

The more recent name "Bungarus flaviceps baluensis Loveridge, 1938", widely appearing in the literature (e.g. Manthey 1983 and Sang et al. 2009) is a junior synonym of the Gray name.

M. flaviceps formosus is further characterised by usually having the first and second labial merged to form one larger one.

M. flaviceps promontoriumrursus subsp. nov. from Peninsula Malaysia and Thailand are further separated from the other three subspecies by the presence of a wide squarish border on the second upper labial as well as a generally whtish belly.

M. flaviceps masalbidus subsp. nov. from northern Sumatra are separated from the other three subspecies by the combination of the following characters: a high ventral count (over 215 in both sexes), more or less triangular second upper labial and generally whitish belly.

Only M. flaviceps formosus has a similar ventral count and that taxon from Borneo can be readily separated from M. flaviceps masalbidus subsp. nov. by the radically different dorsal colour pattern, including cross-bands and a well-defined yellow vertebral stripe as outlined above.

Distribution: Peninsula Malaysia and nearby Thailand.

Etymology: The name promontorium rursus refers in Latin to the obviously ridged back of this taxon.

## MEGAEROPHIS FLAVICEPS MASALBIDUS SUBSP. NOV.

Holotype: A preserved female specimen in the Museum of Natural History (UK) BMNH specimen number: 1858.4.20.15 collected from Sumatra. The Museum of Natural History in London, UK allows access to its holdings.

Diagnosis: The species currently known as Bungarus flaviceps Reinhardt, 1843, (now placed in Megaerophis) is herein divided into four allopatric subspecies, two of which are also formally named for the first time.

This species is separated from all others in the tribe by having subcaudals divided or partly single and partly divided and 13 dorsal mid-body rows.

It is further diagnosed by the following suite of characters: expanded neural crest of vertebrae forms distinct ridge down the back and tail; subcaudals undivided, although anteriorly those near the tip may be divided; ventrals: males 193-236, females 193-217; subcaudals: males 47-53, females 42-54. Black above; orange-yellow dorsal stripe often present; interstitial skin orangeyellow giving appearance of longitudinal stripes; head reddish to orange-yellow; tail and posterior part of body reddish to orangeyellow; belly orange, yellow, brown or whitish, sometimes edged with brown. (modified from Smith, 1943 at p. 411.).

The nominate subspecies Megaerophis flaviceps flaviceps Reinhardt, 1843 is separated from the other three subspecies by having less than 200 ventrals, versus over 200 in all other

All of M. flaviceps flaviceps Reinhardt, 1843, M. flaviceps promontoriumrursus subsp. nov. from Peninsula Malaysia and Thailand, and M. flaviceps masalbidus subsp. nov. from northern Sumatra are characterised by a dorsal colouration of greyish

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black in colour and with a very distinctive orange to red head and tail and no overtly obvious body pattern or dorsal streak.

Both M. flaviceps flaviceps Reinhardt, 1843 and M. flaviceps promontoriumrursus subsp. nov. from Peninsula Malaysia and Thailand are characterised by a series of small yellow dots along the vertebral line, a yellow lateral streak along the two outer rows of scales a red tail and an elongate black marking on the back of the head. M. flaviceps flaviceps Reinhardt, 1843 has a yellowish or brown belly, versus whitish in M. flaviceps promontoriumrursus subsp. nov..

The subspecies M. flaviceps formosus (Gray, 1849) from the northern parts of Borneo, is easily the most divergent subspecies in terms of dorsal colouration, characterised by irregular white, red and black crossbands (that are absent in other subspecies) as well as a distinctive yellow vertebral line.

The more recent name "Bungarus flaviceps baluensis Loveridge, 1938", widely appearing in the literature (e.g. Manthey 1983 and Sang et al. 2009) is a junior synonym of the Gray name.

M. flaviceps formosus is further characterised by usually having the first and second labial merged to form one larger one.

M. flaviceps promontoriumrursus subsp. nov. from Peninsula Malaysia and Thailand are further separated from the other three subspecies by the presence of a wide squarish border on the second upper labial as well as a generally whiish belly.

M. flaviceps masalbidus subsp. nov. from northern Sumatra are separated from the other three subspecies by the combination of the following characters: a high ventral count (over 215 in both sexes), more or less triangular second upper labial and a generally whitish belly.

Only M. flaviceps formosus has a similar ventral count and that taxon from Borneo can be readily separated from M. flaviceps masalbidus subsp. nov. by the radically different dorsal colour pattern, including cross-bands and a well-defined yellow vertebral stripe as outlined above.

Distribution: Sumatra and mainly in the hilly parts to the north and west.

Etymology: The name masalbidus refers in Latin to the whitish coloured belly of this taxon.

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## **CONFLICT OF INTEREST**

The author has no known conflicts of interest in terms of this paper and conclusions within.