

A review and rearrangement of Pitviper genera (Serpentes: Viperidae: Crotalinae).

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ABSTRACT

The generic arrangement of the Vipers has been subject of considerable change in recent years. The majority of reviews in the period 1990-2013 have tended to divide formerly large genera along phylogenetic lines.

Most recently erected genera have had widespread acceptance within the herpetological community.

A review of the Viperidae has shown inconsistent treatment of species groups, with some accorded recognition at the genus level, while others of similar divergence remain subsumed within larger paraphyletic genera.

In order to make the treatment of Viper species at the genus level consistent, a review was undertaken including checking all relevant published literature, descriptions and phylogenies as well as direct inspection of specimens, including live, photos and museum specimens.

As a result of earlier published papers by myself (including a paper published simultaneously to this one) (Hoser 2013c) and papers by others, the taxonomy and nomenclature of the True Vipers (Viperinae) appears to be consistent, based on this review. However, within the Pitvipers a very different picture emerged with several groups (clades) requiring formal taxonomic recognition at the genus or subgenus level.

This was most notably the case for the deeply divergent and morphologically convergent Asian taxa.

As a result, these unnamed groups are formally described for the first time, according to the Zoological Code (Ride *et al.* 1999).

All groups are named on the basis of robust morphological and molecular data (refer to Hoser 2013b) and as identified in this paper.

These are 8 newly named genera and 8 newly named subgenera.

At the subfamily level, two morphologically divergent Tribes, namely Calloselasmiini Hoser, 2013 (Hoser 2013a) and Tropicolaemusini Hoser, 2012 are each placed in newly defined subfamilies on the basis of recent phylogenetic studies and published results which shows their continued placement within Crotalinae to be problematic.

An updated list of Viper subfamilies, tribes and genera is presented.

Keywords: Taxonomy; Pitvipers; new subfamilies; Tropicolaemusiinae; Calloselasmiinae; new genera; *Sloppvipera*; *Conantvipera*; *Katrinahoserviperea*; *Ninvipera*; *Ryukyuvipera*; *Cummingviperea*; *Crottyvipera*; *Swilevipera*; new subgenera; *Blackleyviperea*; *Pughvipera*; *Davievipera*; *Cottonvipera*; *Lowryvipera*; *Simpsonvipera*; *Yunnanvipera*; *Borneovipera*.

INTRODUCTION

The generic arrangement of the Vipers has been subject of considerable change in recent years as detailed by Hoser (2012c) and sources cited therein.

The majority of reviews in the period 1990-2013 have tended to divide formerly large genera along phylogenetic lines.

Most of the recently erected genera have had widespread acceptance within the herpetological community, being republished widely (Hoser 2012c).

A review of the Viperidae has shown inconsistent treatment of species groups, with some accorded recognition at the genus level, while others of similar divergence remain

subsumed within larger paraphyletic genera.

In order to make the treatment of Viper species at the genus level consistent both within the group and with reference to other snakes and for that matter other vertebrate groups, a review was undertaken. As a result of other papers by myself, including one published at the same time as this (Hoser 2013c), naming two True Viper subgenera within the genus *Bitis* Gray, 1842, and papers by others (cited below), the taxonomy and nomenclature of the True Vipers (Viperinae) appears to be consistent and is therefore not subject of this paper.

However, within the Pitvipers a very different picture emerged with several groups (clades) requiring formal taxonomic recognition at the genus or subgenus level.

These groups are easily differentiated by both morphological and molecular evidence as cited below.

Hence it has not been a difficult decision to assign names to groups for which no names were available.

The Rattlesnakes (Crotalini Gray, 1825) were dealt with in detail by Hoser (2009) and Hoser (2012d) and have had the generic rearrangements of those papers effectively re-validated by the molecular results of Pyron *et al.* (2011 and 2013), noting both papers specifically endorsed the taxonomic position of the Hoser papers reaffirming the parphyly of the rattlesnake genera (read *Crotalus* Linnaeus, 1758 and *Sistrurus* Garman, 1884).

There is no need to interfere with the taxonomy of that group further, although I maintain full support for the nomenclatural position of Hoser (2012d) in this paper.

Likewise the generic arrangement of species within the tribe Caloselasmaiini Hoser 2013 (Hoser 2013a) does not need rearranging.

The tribe Agkistrodonini Hoser, 2012 is not in need of review or change, save for the fact that the genus *Agkistrodon* Palisot de Beauvois, 1799 should be split into subgenera along obvious morphological lines. The species *A. contortrix* (Linnaeus, 1766), that with the distinctly pointed snout that overshoots the mouth, remains within the subgenus *Agkistrodon* while the other three more bluntly snouted species are within the subgenus *Toxicophis* Troost, 1836, a group originally described as a full genus.

It is of course ethical that I resurrect earlier names, even if unused to date, rather than to destabilize the zoological nomenclature and break the Zoological Code by creating a new junior synonym for the same taxon.

The tribe Trimeresurusini Hoser, 2012, as detailed in Hoser (2012c) contains genera as presently recognized in need of division to maintain consistency in relation to other viper species groups.

This is in spite of the erection of the new genera *Adelynhoserea* Hoser, 2012, and *Oxyus* Hoser, 2012, both being within the tribe.

The same applies for the tribes Jackyhoserini Hoser, 2012, and Adelynhoserserpenini in spite of the erection of the new genera *Jackyhoserea* Hoser, 2012 and *Adelynhoserserpenae* Hoser, 2012 respectively within each genus grouping.

The tribe Lachesini Cope, 1900, as defined by Hoser, 2012 also requires division of genera to make the treatment of species consistent and there are available names for the affected genera.

I also note that Hoser (2012) inadvertently omitted the genus *Mixcoaltus* (Jaden, Smith and Campbell, 2011) containing three species. These should be treated as within Lachesini.

The genus *Peltopelor* Günther 1864, for the species *Trimeresurus macrolepis* Beddome, 1862 was inadvertently omitted from the tribe Trimeresurusini Hoser, 2012.

Likewise for the genus *Ceratimeresurus* Liang and Liu in Liang, 2003, herein recognized and divided into two subgenera within the tribe Trimeresurusini Hoser, 2012.

The genus *Ceratimeresurus* Liang and Liu in Liang, 2003, was originally described as monotypic for the horned viper species *Ceratimeresurus shenlii* Liang and Liu in Liang, 2003, later synonymized with the species *Protobothrops cornutus* (Smith, 1930), by David *et al.* (2008).

This paper formally recognizes the genus *Ceratimeresurus* as being distinct from *Protobothrops* and expands it to include two more species, namely, *Trimeresurus jerdonii* Günther, 1875 and *Trimeresurus xiangchengensis* Zhao, Jiang and Huang, 1979, the inclusion of these taxa being based on both the molecular and morphological studies cited herein.

As a result, I provide a new diagnosis for this genus in this paper.

The genus *Ceratimeresurus* is in turn split two ways to subgenera to divide the species with horns above the eyes (type for the genus) from the others, noting that *Ceratimeresurus jerdonii* (Günther, 1875) as recognized here includes more than one species level taxa.

In the treatment below I do not repeat detailed information in terms of the said snakes repeated elsewhere.

Furthermore I do not rehash the detail of the tribal and subtribe arrangements of the Pitviper genera as this has already been dealt with by Hoser (2012c) and that paper remains widely available, both in hard copy and online as a pdf via links from the internet portal at: <http://www.herp.net>. Instead each species group of relevance and in need of placement in a new genus or subgenus is merely diagnosed and described according to the Zoological Code (Ride *et al.* 1999) and in relation to the genus and species group they were formerly placed within, thereby making the new names available under the Zoological Code.

As a result of this review and on the basis of the evidence within the sources cited, there are 8 new genera and 8 new subgenera formally named for the first time.

On the basis of the evidence within the sources cited, I also note the resurrection of the following:

The genus *Teleuraspis* Cope, 1860 for the species *Teleuraspis schlegeli* Berthold, 1846 and *Bothrops schlegelii supraciliaris* Taylor, 1954, regarded herein as a full species in the same genus:

The genus *Thamnocenchris* Salvin, 1860 (type species: *Thamnocenchris aurifer*) is herein recognized as a subgenus within *Bothriechis* Peters, 1859 and includes the morphologically similar species: *Bothriechis rowleyi* (Bogert, 1968), *B. bicolor* (Bocourt, 1868), *B. thalassinus* Campbell and Smith 2000 and *B. marchi* (Barbour and Loveridge, 1929). As a result the subgenus *Bothriechis* Peters, 1859 is confined to the species *B. nigroviridis* Peters, 1859 and *B. lateralis* Peters, 1862:

The genus *Zhaoermia* Zhang, 1993 is regarded as valid for the species *Trimeresurus mangshanensis* Zhao, 1990 (commonly placed in the genus *Protobothrops* Hoge and Romano-Hoge, 1983 by other recent authors). The recognition of *Zhaoermia* is in line with the view of Hoser 2012c and further validated by the published phylogeny of Pyron *et al.* (2013).

The genus *Craspedocephalus* Kuhl and van Hasselt, 1822 is

resurrected for the species *Cophias punicea* Boie, 1827, better known as *Trimeresurus puniceus* (Boie, 1827) and *T. borneensis* (Peters, 1872) which is herein placed in a newly named subgenus.

The genus *Atropos* Wagler, 1830 is herein treated as junior synonym for *Craspedocephalus* Kuhl and van Hasselt, 1822 as it has the same type species (McDiarmid *et al.* 1999).

All newly resurrected or named genera and subgenera would as a matter of course be placed in the same tribes from where the genus they are derived from came.

The formally named groups are as follows:

Genera: *Sloppvipera gen. nov.* for a species formerly placed within *Tropidolaemus* Wagler, 1830: *Conantvipera gen. nov.*, *Katrinahoservipera gen. nov.*, and *Ninvipera gen. nov.* for species formerly within the genus *Gloydus* Hoge and Romano-Hoge, 1981: *Ryukyuvipera gen. nov.* for species formerly within the genus *Ovophis* Burger, 1981; *Cummingvipera gen. nov.* and *Crottyvipera gen. nov.* for species formerly placed within the genus *Protobothrops* Hoge and Romano-Hoge, 1983; and *Swilevipera gen. nov.* for a species formerly placed within the genus *Parias* Gray, 1849.

Subgenera: *Blackleyvipera subgen. nov.* for species within the genus *Rhinocerocephalus* Garman, 1881; *Pughvipera subgen. nov.* for a species within the genus *Bothrocophias* Gutberlet and Cambell, 2001; *Davievipera subgen. nov.* for species within the genus *Porthidium* Cope, 1871; *Cottonvipera subgen. nov.* for species within the genus *Ovophis* Burger, 1981; *Lowryvipera subgen. nov.* for two species formerly within the genus *Protobothrops* Hoge and Romano-Hoge, 1983 and herein placed within the genus *Ceratrimeresurus* Liang and Liu in Liang, 2003, in addition to the type species for that genus;

Simpsonvipera subgen. nov. and *Yunnanvipera subgen. nov.* each for a single species within the genus *Viridovipera* Malhorta and Thorpe, 2004; *Borneovipera subgen. nov.* for species within the genus *Craspedocephalus* Kuhl and van Hasselt, 1822.

In terms of diagnoses of the original source genera, I rely upon the original diagnosis for each of the relevant genera as cited in the paragraphs above, including as defined in the material cited immediately below.

Published sources of relevant taxonomic data and opinions relied upon include: Beaman and Hayes (2008), Bocourt (1868), Boulenger (1888, 1890, 1892, 1896), Boulenger *et al.* (1907), Boundy (2007), Bourret (1934), Broadley (1996), Bryson *et al.* (2011), Campbell and Lamar (2004), Campbell and Smith (2000), Carrasco *et al.* (2009), Castoe and Parkinson (2006), Castoe *et al.* (2005), Cope (1887), David (1995), David and Tong (1997), David and Vogel (1998, 2012), David *et al.* (2001, 2002a, 2002b, 2006, 2008, 2011), Dawson, *et al.* (2008), De Rooij (1917), Duméril *et al.* (1854), Fenwick, *et al.* (2009), Fernandes (2005), Fernandes *et al.* (2004), Garman (1881), Garrigues *et al.* (2005), Gloyd and Conant (1989), Gong *et al.* (2011), Grismer *et al.* (2006), Gumprecht *et al.* (2004), Groombridge (1986), Gumprecht and Tillack (2004), Gumprecht *et al.* (2004), Günther (1864), Guo *et al.* (1999a, 1999b, 2006, 2007, 2009), Gutberlet and Campbell (2001), Harvey (1994), Heise *et al.* (1995), Herrmann *et al.* (1992, 2002), Hoge and Romano-Hoge (1981, 1983), Hoser (2012a, 2012b, 2012c, 2012d, 2012e, 2012f, 2012g, 2012h, 2013a, 2013b, 2013c), Ineich, *et al.* (2006), Isogawa *et al.* (1994), Jadin *et al.* (2010, 2011), Jan (1859), Jiang and Zhao (2009), Kardong (1986), Kelly *et al.* (2003), Klauber (1972), Koch (2008), Kraus, *et al.* (1996),

Kuch *et al.* (2007), Lawson (1977), Lenk *et al.* (2000), Leviton *et al.* (2003), Lidth de Juede (1886, 1922), Liem *et al.* (1971), Liu *et al.* (1989), Malhorta and Thorpe (2000, 2004, 2005), Marx and Olechowski (1970), McCranie (2011), McDiarmid *et al.* (1999), Mebs *et al.* (1994), Meik and Pires-daSilva (2009), Orlov (1997), Orlov and Barabanov (1999), Orlov *et al.* (2002, 2009), Nutphand *et al.* (1991), Pan *et al.* (2013), Parkinson (1999), Peng and Fuji (2001), Peters (1859, 1872), Pitman (1974), Pyron *et al.* (2011, 2013), Ryabov (2003), Sanders *et al.* (2002), Schätti and Kramer (1993), Schmidt (1925), Schnurrenberger (1959), Sharma (2004), Smith (1941), Smith (1939, 1949), Smith *et al.* (1977), Spawls and Branch (1995), Stejneger (1907), Sterer (1992), Stevens (1973), Stümpel and Joger (2009), Taggart *et al.* (2001), Takahashi (1922, 1930), Taylor (1965), Tillack *et al.* (2003), Toda *et al.* (1999), Toriba (1992), Tu *et al.* (2000), Vidal and Leconte (1998), Vogel (2006), Wall (1906), Wang and Zhao (2006), Werman (1984, 1992), Werner *et al.* (1991), Whitaker and Captian (2004), Wüster and Bérnills (2011), Xu *et al.* (2012), Yang *et al.* (2011), Zamudio and Green (1997), Zhang (1993, 1998), Zhang *et al.* (2011), Zhao (1977, 1995, 1997), Zhao and Adler (1993), Zhao and Zhao (1991) and Ziegler *et al.* (2001) and sources cited therein.

This material provides both a morphological and molecular basis for all the relevant taxonomic judgments herein and are the main body of evidence with which the conclusions can be judged against. Of note is that no genera were erected for species groups that are believed to have diverged less than 6 million years before present as the most conservative of positions, meaning the position taken herein remains more conservative than that used in comparable mammal taxonomy.

The tribe *Trimeresurusini* Hoser, 2012 while defined in terms of the component genera and/or by exclusion of other tribes defined in the same paper did contain errors. Therefore the tribe is redefined herein and including a definition in terms of the diagnostics of the snake species themselves as was done for all the other viper tribes in Hoser (2012).

While listed below as Hoser (2012), in the event that another herpetologist decides for any reason that the description of *Trimeresurusini* Hoser (2012) was not valid under the current zoological code, then the below description must be treated as "*tribe nov.*" in order to maintain nomenclatural stability.

The description of *Trimeresurusini* Hoser, 2012 also made the error of failing to account for the genera placed within the tribe *Tropidolaemusini* Hoser, 2012, even though it was the next listed tribe in the paper and clearly listed in the paper as another tribe with other named genera.

A revisit of the data available shows that both Tribe Calloselasmaiini Hoser, 2013 and *Tropidolaemusini* Hoser, 2012 sit roughly midway between the subfamilies Azemiopinae Liem, Marx and Rabb, 1971 and Crotalinae Opperl, 1811 in terms of their phylogeny (see for example Pyron *et al.* 2013), making their long-term placement within the latter subfamily untenable, unless all are merged into a single subfamily (Crotalinae), or within the Viperidae Opperl, 1811 at the sub-family level (Viperinae Opperl, 1811), which in effect defeats the purpose of having subfamilies.

I regard that as unsatisfactory, especially when compared to mammalian phylogenies and the taxonomy and nomenclature that results, noting the relevant dates of divergence.

Therefore I hereby create two new subfamilies, which in effect t the present time mirror the groups defined by the

tribes Calloselasmaiini Hoser, 2013 and *Tropidolaemusini* Hoser, 2012, both defined below according to the Zoological Code.

The tribe *Tropidolaemusini* Hoser, 2012 (and corresponding subfamily) does of course gain the genus *Sloppvipera gen. nov.*, created by a division of the genus *Tropidolaemus* Wagler, 1830, as done at the same time in this paper.

For completeness, this paper ends with a listing of the Viperidae by subfamily, tribal groupings and genera, including subtribes, but excluding subgenera.

CALLOSELASMIINAE SUBFAM. NOV.

(Terminal taxon: *Trigonocephalus rhodostoma* Kuhl, 1824)

Generally currently known as *Calloselasma rhodostoma* (Kuhl, 1824)

Diagnosis: This subfamily within the Viperidae, consists of two distinct genera (the tribe Calloselasmaiini Hoser, 2013) and they are defined herein separately as a composite diagnosis for the subfamily and its contents.

The species taxon, *Calloselasma rhodostoma*, monotypic for the genus is the only Asian pit viper with large crown scales and smooth dorsal scales.

There are three species within the genus *Hypnale*. All are readily identified by their more-or-less upturned snouts that produce a sort of hump-nosed effect (hence the common name "Humpnosed Vipers"). This separates them from all other vipers.

All taxon within this group are moderately stout snakes. The Malayan Pitviper, *Calloselasma rhodostoma* is found in Southeast Asia from Thailand to northern Malaysia and on the island of Java. Attains an average total body length of 76 cm, with females being slightly larger than males. The largest recorded length is 91 cm. The species is oviparous (lays eggs).

The three species of *Hypnale* occur in South-west India and island Sri Lanka. Members of this genus grow to a maximum total length of 55 cm (for *H. hypnale*). The tail length accounts for 14-18% of the total body length in males, 11-16% in females.

The snout is more or less upturned, with two species having a wart-like protuberance at the tip that is covered with tiny scales.

The anterior head shields are strongly fragmented, but the frontal scale, supraoculars and parietals are complete and quite large. The nasal scale is single, but it may have a groove that extends towards its upper edge. There are two preoculars and 2-4 postoculars.

The loreal scale is single, but extends across the canthus rostralis so that it can be seen from above.

The supralabials and sublabials both number 7-9. Bordering the supralabials are 3-4 enlarged temporal scales, above which are 3-5 irregular rows of temporal scales.

There is one pair of chin shields, each of which is slightly longer than it is wide.

There are 17 dorsal mid-body scale rows, which are weakly keeled.

Apical pits are present, but very difficult to see. The keels are lacking or may be entirely absent on the first two scale rows bordering the ventrals.

There are 120-158 ventrals and 28-48 mainly divided subcaudals.

Content: *Calloselasma* Cope, 1860; *Hypnale* Fitzinger, 1843.

TROPIDOLAEMUSIINAE SUBFAM. NOV.

(Terminal taxon: *Tropidolaemus wagleri*)

Diagnosis: A subfamily of Asian pitvipers consisting of four genera and herein defined by each genus. This diagnosis should also be treated as a modified diagnosis for the tribe Tropidolaemusini Hoser, 2012.

Deinagkistrodon is a monotypic genus for the species *D. acutus*, found in in southern China (Chekiang, Fukien, Hunan, Hupeh, Kwantung), Taiwan, northern Vietnam, and possibly Laos. It is commonly known as the Sharp-nosed Viper.

It is separated from other Asian pitvipers by the following suite of characters:

The back is light brown or greyish brown, with a series of dark brown lateral triangles on each side. The two pointed tops of the two opposite triangles meet each other at the mid-line, forming a series of about twenty light brown, squarish blotches on the back. A row of large black spots extends along each side near the belly. The top and upper sides of the head are uniformly black, with a black streak from the eye to the angle of the mouth; yellowish below, spotted with dark brown. The young are much lighter than the adults with essentially the same pattern.

The head is large, triangular, with an upturned snout. The body is very stout. The tail is short, ending in a compressed, pointed slightly curved cornified scale. The top of the head is covered with nine large plates. Dorsal scales are strongly and tubercularly keeled. Subcaudals are mainly divided, some anterior ones are single. Ranges from 0.8 to 1.0 metre (2.6 and 3.3 ft) in total length, with the longest recorded length being a male of 61 inches or 1.549 metres (5.08 ft).

Garthius is monotypic for the species *chaseni*, known as Chasen's mountain pit viper.

It is a small, stocky terrestrial pitviper, not exceeding a metre.

Dorsally it's brownish with irregular blackish, light-edged blotches which become transverse bands posteriorly. The belly is yellow with grey specks. There's an oblique black stripe behind the eye bordered below with white.

Currently known only from Mt. Kinabalu, Borneo (Indonesia).

Garthius is separated from other Asian Pitvipers by the following suite of characters: Scalation includes 15-19 dorsal mid-body scale rows, 130-143 ventrals, 20-30 divided subcaudals and 6 supralabials with the third being the highest.

Tropidolaemus as defined herein is a genus of four currently described species, commonly known as the Temple Vipers. A fifth species which conforms to the diagnosis immediately below, is now placed in the genus *Sloppvipera gen. nov.*

The two genera are separated from other Asian pitvipers including the superficially similar *Trimeresurus* Lacépède, 1804, by the following suite of characters: absence of a nasal pore, the upper surfaces of the snout and head are covered with distinctly covered small scales, strongly keeled gular scales, second supralabial not bordering the anterior margin of the loreal pit and topped by a prefoveal, and a green colour in juveniles that may or may not change with age.

Sloppvipera gen. nov. differ from all other known

Tropidolaemus by (1) a higher Tail/Total length ratio, 0.279 vs. 0.179-0.196 in juveniles of *T. wagleri* of same size and sex (David and Vogel, 1998, p. 62); (2) a bright red tip of the snout when the snake is alive, this colouration fading in alcohol but was conspicuous when the live juveniles were collected; and (3) an upturned snout in *S. huttoni* (formerly *T. huttoni*) (not seen to this extent if at all, in all other known

Tropidolaemus).

General scale counts such as ventrals and mid-body rows for *Sloppvipera gen. nov.* do sit within the known range for *Tropidolaemus* making separation of the genera by this means problematic.

The two genera are separated by distribution, with *Sloppvipera gen. nov.* found in the District of Madurai, State of Tamil Nadu, South India, as opposed to *Tropidolaemus* which is found in Indonesia, the Philippines and immediately adjacent mainland of South-east Asia only.

Furthermore the known habits of the two genera are strongly contrasted, with *Sloppvipera gen. nov.* clearly a montane genus, as opposed to *Tropidolaemus* being a wet tropics lowland inhabitant.

Content: *Deinagkistrodon* Gloyd, 1979; *Garthius* Malhorta and Thorpe, 2004; *Sloppvipera gen. nov.* (this paper); *Tropidolaemus* Wagler, 1830.

TRIBE TRIMERESURUSINI HOSER, 2012

(Terminal Taxon: *Trimeresurus gramineus*)

Diagnosis: An Asian tribe of pitvipers, it includes all species from Asia and adjacent areas, except those from the genera *Calloselasma* Cope, 1860 and *Hypnale* Fitzinger, 1843, defined under a different tribe name within the tribe *Calloselasmaiini* Hoser, 2013 and the genera *Deinagkistrodon* Gloyd, 1979, *Garthius* Malhorta and Thorpe, 2004, *Tropidolaemus* Wagler, 1830 and *Sloppvipera gen. nov.*, within the tribe *Tropidolaemusini* Hoser, 2012 (both latter tribes also being placed in separate subfamilies).

The size and shape of the vipers in the tribe *Trimeresurusini* varies, but the greatest number are smallish and arboreal. The greatest degree of diversity is in the region of continental south-east Asia.

The species within the tribe *Trimeresurusini* are separated from other snake taxa and defined as follows: Maxillary bone shortened, movable, with enlarged fang; palatine bone expanded, without a distinct dorsal apophysis; border of cavity of maxillary bone with a slight re-entering curve, forming two distinct curves; head distinct from neck, usually covered with small scales; deep loreal pit present between nostril and eye; pupil of eye vertical; scales smooth or keeled, in 17 to 31 longitudinal rows at midbody; body stout; tail short; ventrals rounded; subcaudals paired, rarely single; hypapophyses present throughout vertebral column; hemipenes forked, ornamentation variable.

In terms of the pitvipers outside this tribe they are as follows: The species taxon, *Calloselasma rhodostoma*, monotypic for the genus is the only Asian pit viper with large crown scales and smooth dorsal scales.

There are three species within the genus *Hypnale*. All are readily identified by their more-or-less upturned snouts that produce a sort of hump-nosed effect (hence the common name Hump-nosed Vipers). This separates them from all other vipers. For further details in terms of the component genera, see within the subfamily *Tropidolaemusiinae subfam. nov.* above.

In terms of the tribe *Tropidolaemusini* Hoser, 2012, the tribe is best defined by defining each component genus.

Deinagkistrodon is a monotypic genus for the species *D. acutus*, found in in southern China (Chekiang, Fukien, Hunan, Hupeh, Kwantung), Taiwan, northern Vietnam, and possibly Laos. It's commonly known as the Sharp-nosed Viper.

It is separated from other Asian pitvipers by the following suite of characters:

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Sloppvipera gen. nov. differ from all other known *Tropidolaemus* by (1) a higher Tail/Total length ratio, 0.279 vs. 0.179-0.196 in juveniles of *T. wagleri* of same size and sex (David and Vogel, 1998, p. 62); (2) a bright red tip of the snout when the snake is alive, this colouration fading in alcohol but was conspicuous when the live juveniles were collected; and (3) an upturned snout in *S. huttoni* (formerly *T. huttoni*) (not seen to this extent if at all, in all other known *Tropidolaemus*).

General scale counts such as ventrals and mid-body rows for *Sloppvipera gen. nov.* do sit within the known range for *Tropidolaemus* making separation of the genera by this means problematic.

The two genera are separated by distribution, with *Sloppvipera gen. nov.* found in the District of Madurai, State of Tamil Nadu, South India, as opposed to *Tropidolaemus* which is found in Indonesia, the Philippines and immediately adjacent mainland of South-east Asia only.

Furthermore the known habits of the two genera are strongly contrasted, with *Sloppvipera gen. nov.* clearly a montane genus, as opposed to *Tropidolaemus* being a wet tropics lowland inhabitant.

SLOPPVIPERA GEN. NOV.

Type species: *Trimeresurus huttoni* Smith, 1949.

Diagnosis: The genus *Tropidolaemus* Wagler, 1830 is a pitviper genus defined by the absence of a nasal pore, upper surfaces of the snout and head covered with distinctly keeled small scales, strongly keeled gular scales, the second supralabial not bordering the anterior margin of the loreal pit and topped by a prefoveal and a green coloration in juveniles which may or may not change with growth and age.

The type species for *Sloppvipera gen. nov.* (*Trimeresurus huttoni* Smith, 1949) was placed in the genus *Tropidolaemus* Wagler, 1830 by David and Vogel (1998) on the basis of shared morphological characteristics.

However a revisiting of their published data shows that the species is neither appropriately placed within either of the genera *Trimeresurus* Lacépède, 1804 or *Tropidolaemus* Wagler, 1830.

As there is no available generic name for this taxon, it is entirely appropriate one is defined herein.

Sloppvipera gen. nov. is defined and separated from *Trimeresurus* by the following suite of characters (taken from the two known juveniles):

Sloppvipera gen. nov. differ from all other known *Tropidolaemus* by (1) a higher Tail/Total length ratio, 0.279 vs. 0.179-0.196 in juveniles of *T. wagleri* of same size and sex (David and Vogel, 1998, p. 62); (2) a bright red tip of the snout when the snake is alive, this colouration fading in alcohol but was conspicuous when the live juveniles were collected; and (3) an upturned snout in *S. huttoni* (formerly *T. huttoni*) (not seen to this extent if at all, in all other known *Tropidolaemus*).

General scale counts such as ventrals and mid-body rows for *Sloppvipera gen. nov.* do sit within the known range for *Tropidolaemus* making separation of the genera by this means problematic.

The two genera are separated by distribution, with *Sloppvipera gen. nov.* found in the District of Madurai, State of Tamil Nadu, South India, as opposed to *Tropidolaemus* which is found in Indonesia, the Philippines and immediately adjacent mainland of South-east Asia only.

Furthermore the known habits of the two genera are strongly contrasted, with *Sloppvipera gen. nov.* clearly a montane genus, as opposed to *Tropidolaemus* being a wet tropics lowland inhabitant.

Distribution: Known from only two specimens, both from "The high Wavy Mountains", Varushanad Hills, District of Madurai, State of Tamil Nadu, South India at an elevation of about 5200 feet.

Conservation Implications: The species *Sloppvipera huttoni* (Smith, 1949), is known from just two specimens and is monotypic for the new genus and likely to remain that way on the assumption no similar species are discovered.

The two known specimens were collected from beneath leaves of a Hill Bamboo (*Ochlandra travancorica*) clump, locally known as "Eeta" in Tamil. Diet and other aspects of the snake are effectively unknown and can only be inferred from the reported morphological features as published by David and Vogel (1998). According to Hutton's description, only a small area on the plateau was cultivated at the time. This cultivation has greatly expanded and means that the species *Sloppvipera huttoni* (Smith, 1949) could be threatened or perhaps extinct.

Noting the continued environmental pressures within the region and the ease with which Pitvipers breed in captivity. I

strongly recommend that specimens be removed from the wild (if able to be located) and bred for zoo exhibits and private herpetoculture.

I also strongly recommend that bureaucratic impediments to the collection and transport of specimens to places where people are willing and able to keep and breed the species are removed.

Etymology: Named in honour of our pet Great Dane, Slopp, who has successfully guarded the Snakebusters research and education facility from several attacks by police-protected criminals and thieves.

In response to widely published complaints both in hard copy and online by serial liars and truth haters Wolfgang Wüster, Mark O'Shea (both of the UK), Hinrich Kaiser (of the USA) and Wulf Schleip (of Germany) and other ratbags associated with them who allege it is inappropriate to use a dog's name for an etymology, I make no apology for taking the opportunity to honour a four-legged co-inhabitant of our planet.

I pride myself as an animal lover, who always puts animal welfare as the highest priority and strongly resent the gross mistreatment of mammals and reptiles by the likes of Wüster and O'Shea who routinely attack snakes with brutal metal tongs whose main function is to break the delicate rib bones and spinal cords of snakes held in these devices.

While the appropriate placement of the species *Trimeresurus huttoni* Smith, 1949 into a new (presently monotypic) genus is in effect a "no-brainer" based on the publicly available evidence, there is little doubt that Wüster and O'Shea will break all rules and ethics to sabotage the use of the name and act in breach of the Zoological Code (Ride *et al.* 1999) to improperly create nomenclatural instability, as they have done in the past (see Hoser 2013b and sources cited therein).

BLACKLEYVIPEREA SUBGEN. NOV.

Type species: *Bothrops alternatus* Duméril, Bibron and Duméril, 1854.

Diagnosis: The genus *Rhinocerocephis* Garman, 1881 which is where this subgenus is contained, is diagnosed as follows:

Rhinocerocephis differs from all other South American pitvipers in 27 mitochondrial characters, and in having few (1 or 2) palatine teeth (versus 3-6 teeth in all others), which is a morphological synapomorphy. Distribution is in southern South America, combined with terrestrial habitat in open areas, grasslands, swamps, or broad-leaf and Araucaria forests, and further distinguishes this genus from others.

Rhinocerocephis individuals have the maxillary fang shorter than the height of the maxilla, and show black bars on the gular scales of some species (*R. alternatus*, *R. cotiara*, *R. fonsecai*, and *R. jonathani*). *Rhinocerocephis* have fewer subcaudals (25-55) than the other genera (31-86), and some specimens have high numbers of supralabials (7-10, also seen in *Bothropoides*; other South American genera have 7-8). *Rhinocerocephis* differs from *Bothrops* and *Bothriopsis* (as defined until now and including new genera split from them) in having the prelacunal scale separated from the second supralabial. It differs from *Bothriopsis* in the lack of green coloration and in the lack of a prehensile tail. It differs from *Bothrocophias* in the lack of tuberculate keels on posterior dorsal scales. Almost all species differ from *Bothrocophias* in colour pattern: whereas *Bothrocophias* species have spade-shaped dorsal markings lacking spots between the spades, *Rhinocerocephis* species have spots between the spades (*R. alternatus*, *R. cotiara*, and *R. fonsecai*), have trapezoidal markings with spots between them (*R. itapetiningae*), or have

a checkered pattern (*R. ammodytoides*). Only *R. jonathani* lacks spots between spades, but it can be distinguished by the presence of black bars on the gular scales, as mentioned above.

All species within the genus *Rhinocerophis* Garman, 1881 are in the subgenus *Blackleyviperea subgen. nov.* except for the type for the genus *Rhinocerophis*, namely *R. ammodytoides* (Leybold, 1873).

Therefore all snakes within the subgenus *Blackleyviperea subgen. nov.* are separated most easily from the nominate subgenus by the absence of a dorsal checkered pattern. Campbell and Lamar (2004), pages 368-369, give a full diagnosis of the species *R. ammodytoides* (Leybold, 1873), enabling further separation of the subgenera. The same text contains a key to relevant species in both subgenera and also diagnostic information for each species.

Distribution: Southern South America.

Etymology: Named in honour of Caroline Blackley of Romford, London, UK, for contributions to herpetology.

Content: *Rhinocerophis (Blackleyviperea) alternatus* (Duméril, Bibron and Duméril, 1854) (type species); *R. (Blackleyviperea) cotiara* (Gomes, 1913); *R. (Blackleyviperea) fonsecai* (Hoge and Belluomini, 1959); *R. (Blackleyviperea) itapetiningae* (Boulenger, 1907); *R. (Blackleyviperea) jonathani* (Harvey, 1994).

PUGHVIPERA SUBGEN. NOV.

Type species: *Bothrops campbelli* Freire-Lascano, 1991.

Diagnosis: The subgenus *Pughvipera subgen. nov.* is contained within the genus *Bothrocophias* Gutberlet and Cambell, 2001 and is restricted to the type species and the similar species *B. myersi* Gutberlet and Campbell, 2001. The other four described and recognized species remain in the nominate subgenus *Bothrocophias* Gutberlet and Cambell, 2001, those being *Bothrocophias colombianus* (Rendahl and Vestergren, 1940), *B. hyoprora* (Amaral, 1935), *B. microphthalmus* (Cope, 1876) and *B. rhombeatus* Garcia, 1896.

The genus *Bothrocophias* Gutberlet and Cambell, 2001 is defined herein based on the original description and as follows: Members of the six species included in this lineage are of moderate length, relatively stout-bodied, and terrestrial, lacking a prehensile tail. Females attain greater size than do males. The snout is weakly elevated in (*B. campbelli* and *B. myersi*) and strongly elevated in the four species remaining in the nominate subgenus.

The rostral scale is approximately as high as broad or distinctly higher than broad.

Dorsal coloration within the genus consists mainly of darker shades of brown and reddish-brown. A pattern of dorsal banding may be clearly evident or subdued, and in some specimens the bands do not meet evenly at the middorsal line and are staggered as large lateral blotches.

Derived characteristics shared by the six species of *Bothrocophias* include small, smooth intersupraocular scales; distinctive white spots on gular and infralabial scales; and tuberculate keels on scales on the caudal portion of the dorsum. Many, though not all, specimens of *B. hyoprora* and *B. microphthalmus* exhibit tiny scales between the rostral and internasals that have not been observed in any other New World pitviper.

There are 124-177 ventrals; 38-64 subcaudals, most of which are entire in *B. hyoprora*, but mostly divided in the other species; 21-25 mid-dorsal scale rows; 2-9 smooth intersupraoculars; 7-8 supralabials; 8-11 infralabials; 1-11

prefoveals; 1-3 canthals; and 3-4 interoculabials.

Species of *Bothrocophias* have 4-5 palatine teeth, 12-15 pterygoid teeth, and 14-16 dentary teeth.

The maxillary fang is approximately 1.5 times longer than the height of the maxilla.

Hemipenes of these species are calyculate distally. Walls of the more proximal calyces are spinulate. Proximal to the calyces, small mesial spines and a moderate number (ca. 18-30 per lobe) of lateral spines are present.

Though some lateral spines are noticeably larger than the mesial spines, none can be characterized as basal hooks. The hemipenes of *B. hyoprora* differ slightly from those of the new subgenus in having longer and more slender lateral spines.

The following combination of characters diagnoses *Bothrocophias* from all other New World pitviper genera: (1) 7-8 supralabials; (2) small but unkeeled dorsal head scales, not arranged in a nine-plate, colubrid-like pattern; (3) tubercular keels on dorsal scales on posterior half of body; (4) white spots with dark borders on some gulars and infralabials; (5) 124-177 ventrals; (6) 4-5 palatine teeth; (7) 12-15 pterygoid teeth; (8) 14-16 dentary teeth; (9) maxillary fang approximately 1.5 times longer than height of maxilla; (10) mesial spines present on hemipenial lobes; (11) moderate number (ca. 18-30 per lobe) of lateral spines on hemipenes; (12) hemipenial lobes only slightly longer than organ's base; (13) choanal process of palatine attenuate distally; (14) ectopterygoid and base of pterygoid approximately equal in length; (15) dorsal surface of frontal bones predominantly flat; (16) postfrontal bones large, contributing more to dorsal perimeter of orbit than does parietal; (17) tail not prehensile and lacks a rattle.

Snakes in the subgenus *Pughvipera subgen. nov.* are separated from those in the nominate subgenus by the presence of a lacunolabial (versus an absence) and no cathrostrals (versus presence in the nominate subgenus).

Distribution: Northern South America.

Content: *Bothrocophias (Pughvipera) campbelli* (Freire-Lascano, 1991) (Type species); *B. (Pughvipera) myersi* Gutberlet and Campbell, 2001.

Etymology: Named in honour of Mick Pugh of Geelong, Victoria, Australia, a past president of the Victorian Association of Amateur Herpetologists (VAAH) for his numerous contributions to herpetology in Australia spanning some decades.

DAVIEVIPERA SUBGEN. NOV.

Type species: *Bothrops ophryomegas* Bocourt, 1868.

Diagnosis: The genus *Porthidium* Cope, 1871 includes nine described and recognized species of terrestrial snakes ranging collectively from Mexico to Ecuador. In addition to a well defined canthus rostralis, members of *Porthidium* possess a rostral that is higher than it is wide, and the snout is usually attenuate and may be elevated either moderately or greatly, this suite of characters separating them from all other New World Pitvipers. They are terrestrial, less than a meter in overall length, are medium to moderately stout in build, and inhabit xeric or transitional forest (Lawson 1997).

The subgenus *Davievipera subgen. nov.* is most easily diagnosed by the separation of the two component species.

(1) *Porthidium (Davievipera) ophryomegas* (Bocourt, 1868) (the type species) is the only species in the genus with two canthals per side:

(2) *P. (Davievipera) dunni* (Hartweg and Oliver, 1938), is the only species in the genus with the following suite of

characters: The snout is moderately upturned, without a conspicuous nasal appendage; ventrals are variable but usually in excess of 145; there are 19 dorsal scale rows one head length anterior from the vent and 23 dorsal midbody scale rows; a middle preocular that reaches the orbit and is separated from the supralacunal by a vertical suture; 2-3 intercatchals and elevated internasals; the lateral surfaces of the head are mostly dark in colour, with light speckling.

The species remaining within the nominate subgenus *Porthidium* Cope, 1871 are: *Porthidium arcossae* Schatti and Kramer, 1993; *Porthidium hespere* (Campbell, 1976); *Porthidium lansbergii* (Schlegel, 1841); *Porthidium nasutum* (Bocourt, 1868); *Porthidium porrasi* Lamar, 2003; *Porthidium volcanicum* Solorzano, 1995; *Porthidium yucatanicum* (Smith, 1941).

Distribution: *Davievipera* subgen. nov. is found in southern Mexico and areas to the south in Middle America.

Etymology: Named in honour of Neil Davie formerly of West Geelong, Victoria, Australia, now of Lara, Victoria, Australia a past president of the Victorian Association of Amateur Herpetologists (VAAH) for his numerous contributions to herpetology and herpetological taxonomy in Australia spanning some decades.

Content: *Porthidium* (*Davievipera*) *ophryomegas* (Bocourt, 1868) (type species); *P. (Davievipera) dunni* (Hartweg and Oliver, 1938).

CONANTVIPERA GEN. NOV.

Type species: *Ancistrodon strauchi* Bedraiga, 1912.

Currently most widely known as *Gloydus strauchi* (Bedraiga, 1912).

Diagnosis: This paper effectively splits the genus *Gloydus* Hoge and Romano-Hoge, 1981 as defined by them in their paper and popularly recognized by herpetologists since, into four well-recognized species groups, as defined by authors including, Xu *et al.* (2012) and others cited within the paper.

Gloydus with the type species of *Trionocephalus halys* Boie, 1827 also known as *Coluber halys* Pallas, 1776, retains the following species: *G. halys* (Pallas, 1776); *G. intermedius* (Strauch, 1868); *G. shedaoensis* (Zhao, 1979) and *Gloydus saxatilis* (Emelianov, 1937).

Snakes in the genus *Gloydus* are separated from the other three genera defined herein (below) by the possession of 23 dorsal mid-body scale rows and having 3 palatine teeth.

Snakes in the new genus *Conantvipera* gen. nov. are separated from the other three genera by the possession of 19 or 21 dorsal mid-body scale rows, having 4 palatine teeth and lower temporals that are separate from the supralabials (fused in *Ninvipera* gen. nov.). The snout is rounded and the head is relatively small and not sharply wider than the neck. The canthus rostralis is well defined but somewhat rounded. The genus is further diagnosed by having 6-7 supralabials, all dorsal scale rows keeled or with keels that are missing on the lowermost rows; inconspicuous paired apical pits, 145-175 ventrals, 34-44 subcaudals and a distinctive body pattern consisting of four irregular dark longitudinal strips that may sometimes form a zig-zag pattern or alternatively some specimens may be melanistic but with whitish borders on the labials along the mouth-line. Alternatively markings may include a dark more-or-less V-shape on the head and irregular small spots on the body. This genus includes the following species: *Conantvipera strauchi* (Bedraiga, 1912) (type species); *C. monticola* (Werner, 1922), *C. liupanensis* (Liu, Song and Luo, 1989); and *C. qinlingensis* (Song and Chen, 1985).

Snakes in the new genus *Katrinahoservipera* gen. nov. are separated from the other three genera by the following suite of characters: Having obvious paired apical pits, 21 dorsal midbody rows and markings consisting of large dark, rounded or squarish blotches on a pale ground colour. Some of the blotches may meet their partners of the opposite side of the body to form dark crossbands, mainly near the tail; 135-146 ventrals (both sexes).

This genus includes the following species:

Katrinahoservipera blomhoffii (Boie, 1826) (type species) *K. brevicaudus* (Stejneger, 1907); *K. ussuriensis* (Emelianov, 1929); *K. tsushimaensis* (Isogawa, Moriya and Mitsui, 1994) and *K. lijianlii* (Jiang and Zhao, 2009).

The genus *Ninvipera* gen. nov. is monotypic for the type species *Halys himalayanus* Günther, 1864.

It is separated from the other genera by the following suite of characters: it is a brownish snake with a body pattern of variable dark markings, but invariably consisting of 23-45 crossbands distinguishable from the ground colour by their dark edges; cheek stripe diffuse dorsally, bordered below by a narrow dark streak extending posteriorly from the eye onto the neck. Unlike snakes in the other three genera, the head has large prefrontals that are somewhat pointed in front and rounded at the rear and the fusion of the last two or three supralabials with the temporals to form two or three exceptionally large scales along the commissure. The tip of the snout is slightly upturned and it extends further forward than the lower jaw; 146-170 ventrals (both sexes) or 149-170 in females (a number not seen in *Katrinahoservipera* gen. nov.); apical pits are present but easily missed as they are inconspicuous.

Distribution: China.

Etymology: Named in honour of Roger Conant, of the USA, co-author of the monograph *Snakes of the Agkistrodon complex*, (Gloyd and Conant 1989) cited as a valuable source in this paper, in recognition for his excellent scholarship in relation to this very genus of snakes that laid a good foundation for later workers.

Content: *Conantvipera strauchi* (Bedraiga, 1912) (type species); *C. monticola* (Werner, 1922); *C. liupanensis* (Liu, Song and Luo, 1989) and *C. qinlingensis* (Song and Chen, 1985).

KATRINAHOSERVIPERA GEN. NOV.

Type species: *Trionocephalus Blomhoffii* Boie, 1826.

Diagnosis: This paper effectively splits the genus *Gloydus* Hoge and Romano-Hoge, 1981 as defined by them in their paper and popularly recognized by herpetologists since into four well-recognized species groups, as defined by authors including, Xu *et al.* (2012) and others cited within the paper. *Gloydus* with the type species, of *Trionocephalus halys* Boie, 1827 also known as *Coluber halys* Pallas, 1776, retains the following species: *G. halys* (Pallas, 1776); *G. intermedius* (Strauch, 1868); *G. shedaoensis* (Zhao, 1979); *Gloydus saxatilis* (Emelianov, 1937).

Snakes in the genus *Gloydus* are separated from the other three genera defined herein (below) by the possession of 23 dorsal mid-body rows and having 3 palatine teeth.

Snakes in the new genus *Conantvipera* gen. nov. are separated from the other three genera by the possession of 19 or 21 dorsal mid-body rows, having 4 palatine teeth and lower temporals that are separate from the supralabials (fused in *Ninvipera* gen. nov.). The snout is rounded and the head is relatively small and not sharply wider than the neck. The canthus rostralis is well defined but somewhat rounded.

The genus is further diagnosed by having 6-7 supralabials, all dorsal scale rows keeled or with keels that are missing on the lowermost rows; inconspicuous paired apical pits, 145-175 ventrals, 34-44 subcaudals and a distinctive body pattern consisting of four irregular dark longitudinal strips that may sometimes form a zig-zag pattern or alternatively some specimens may be melanistic but with whitish borders on the labials along the mouth-line. Alternatively markings may include a dark more-or-less V-shape on the head and irregular small spots on the body. This genus includes the following species: *Conantvipera strauchi* (Bedraiga, 1912) (type species); *C. monticola* (Werner, 1922); *C. liupanensis* (Liu, Song and Luo, 1989) and *C. qinlingensis* (Song and Chen, 1985).

Snakes in the new genus *Katrinahoservipera gen. nov.* are separated from the other three genera by the following suite of characters: Having obvious paired apical pits, 21 dorsal midbody rows and markings consisting of large dark, rounded or squarish blotches on a pale ground colour. Some of the blotches may meet their partners of the opposite side of the body to form dark crossbands, mainly near the tail; 135-146 ventrals (both sexes).

This genus includes the following species:

Katrinahoservipera blomhoffii (Boie, 1826) (type species)
K. brevicaudus (Stejneger, 1907); *K. ussuriensis* (Emelianov, 1929); *K. tsushimaensis* (Isogawa, Moriya and Mitsui, 1994) and *K. lijianlii* (Jiang and Zhao, 2009).

The genus *Ninvipera gen. nov.* is monotypic for the type species *Halys himalayanus* Günther, 1864.

It is separated from the other genera by the following suite of characters: in that it is a brownish snake with a body pattern of variable dark markings, but invariably consisting of 23-45 crossbands distinguishable from the ground colour by their dark edges; cheek stripe diffuse dorsally, bordered below by a narrow dark streak extending posteriorly from the eye onto the neck. Unlike snakes in the other three genera, the head has large prefrontals that are somewhat pointed in front and rounded at the rear and the fusion of the last two or three supralabials with the temporals to form two or three exceptionally large scales along the commissure. The tip of the snout is slightly upturned and it extends further forward than the lower jaw; 146-170 ventrals (both sexes) or 149-170 in females (a number not seen in *Katrinahoservipera gen. nov.*); apical pits are present but easily missed as they are inconspicuous.

Distribution: The region centered on north-east China, but extending to include a sizeable section of eastern China, the Korean Peninsula, Japan, parts of Mongolia and adjacent parts of the former USSR.

Etymology: Named in honour of my wife, Katrina Hoser, for a contribution to global herpetology spanning decades as well as contributions to the manufacturing and sale of shoes in various places.

Content: *Katrinahoservipera blomhoffii* (Boie, 1826) (type species); *K. brevicaudus* (Stejneger, 1907); *K. ussuriensis* (Emelianov, 1929); *K. tsushimaensis* (Isogawa, Moriya and Mitsui, 1994) and *K. lijianlii* (Jiang and Zhao, 2009).

NINVIPERA GEN. NOV.

Type species: *Halys himalayanus* Günther, 1864.

Diagnosis: This paper effectively splits the genus *Gloydus* Hoge and Romano-Hoge, 1981 as defined by them in their paper and popularly recognized by herpetologists since into four well-recognized species groups, as defined by authors including, Xu *et al.* (2012) and others cited within the paper.

Gloydus with the type species, of *Trigonocephalus halys* Boie, 1827 also known as *Coluber halys* Pallas, 1776, retains the following species: *G. halys* (Pallas, 1776); *G. intermedius* (Strauch, 1868); *G. shedaoensis* (Zhao, 1979); *Gloydus saxatilis* (Emelianov, 1937).

Snakes in the genus *Gloydus* are separated from the other three genera defined herein (below) by the possession of 23 dorsal mid-body rows and having 3 palatine teeth.

Snakes in the new genus *Conantvipera gen. nov.* are separated from the other three genera by the possession of 19 or 21 dorsal mid-body rows, having 4 palatine teeth and lower temporals that are separate from the supralabials (fused in *Ninvipera gen. nov.*). The snout is rounded and the head is relatively small and not sharply wider than the neck. The canthus rostralis is well defined but somewhat rounded.

The genus is further diagnosed by having 6-7 supralabials, all dorsal scale rows keeled or with keels that are missing on the lowermost rows; inconspicuous paired apical pits, 145-175 ventrals, 34-44 subcaudals and a distinctive body pattern consisting of four irregular dark longitudinal strips that may sometimes form a zig-zag pattern or alternatively some specimens may be melanistic but with whitish borders on the labials along the mouth-line. Alternatively markings may include a dark more-or-less V-shape on the head and irregular small spots on the body. This genus includes the following species: *Conantvipera strauchi* (Bedraiga, 1912) (type species); *C. monticola* (Werner, 1922); *C. liupanensis* (Liu, Song and Luo, 1989); and *C. qinlingensis* (Song and Chen, 1985).

Snakes in the new genus *Katrinahoservipera gen. nov.* are separated from the other three genera by the following suite of characters: Having obvious paired apical pits, 21 dorsal midbody rows and markings consisting of large dark, rounded or squarish blotches on a pale ground colour. Some of the blotches may meet their partners of the opposite side of the body to form dark crossbands, mainly near the tail; 135-146 ventrals (both sexes).

This genus includes the following species:

Katrinahoservipera blomhoffii (Boie, 1826) (type species)
K. brevicaudus (Stejneger, 1907); *K. ussuriensis* (Emelianov, 1929); *K. tsushimaensis* (Isogawa, Moriya and Mitsui, 1994) and *K. lijianlii* (Jiang and Zhao, 2009).

The genus *Ninvipera gen. nov.* is monotypic for the type species *Halys himalayanus* Günther, 1864.

It is separated from the other genera by the following suite of characters: in that it is a brownish snake with a body pattern of variable dark markings, but invariably consisting of 23-45 crossbands distinguishable from the ground colour by their dark edges; cheek stripe diffuse dorsally, bordered below by a narrow dark streak extending posteriorly from the eye onto the neck. Unlike snakes in the other three genera, the head has large prefrontals that are somewhat pointed in front and rounded at the rear and the fusion of the last two or three supralabials with the temporals to form two or three exceptionally large scales along the commissure. The tip of the snout is slightly upturned and it extends further forward than the lower jaw; 146-170 ventrals (both sexes) or 149-170 in females (a number not seen in *Katrinahoservipera gen. nov.*); apical pits are present but easily missed as they are inconspicuous.

Distribution: Known only from far northern India, Nepal and adjacent parts of Pakistan

Etymology: Named in honour of Dara Nin, of Ringwood, Victoria, Australia in recognition of his excellent work educating people about reptiles and wildlife conservation

through his working with Snakebusters, Australia's best reptiles shows, displays and educational incursions.

Content: Monotypic for the type species *Ninvipera himalayanus* (Günther, 1864).

RYUKYUVIPERA GEN. NOV.

Type species: *Trimeresurus okinavensis* Boulenger, 1892.

Diagnosis: The genus *Ryukyuvipera gen. nov.* monotypic for the type species is separated from other *Ovophis* Burger, 1981 and all other old-world pitvipers by the following suite of characters:

Snout short, obliquely truncate, with sharp raised angle all round; eye rather small. Rostral deeper than broad; nasal divided; upper head-scales small, subimbricate, smooth on the snout and vertex; 6 to 9 scales in a transverse series between the supraoculars, which are large, larger than the eye; a pair of scales separating the internasals in front; three series of scales between the eye and the labials; temporal scales obtusely keeled; 7 or 8 upper labials, second entering the loreal pit, third largest. Scales strongly keeled, in 21 or 23 dorsal mid-body rows. Ventrals 129-130; anal entire; subcaudals 43-47 all divided: Colouration is brown above, with darker cross-bands or alternating large quadrangular blotches; upper surface of the head is dark brown, sides blackish, with a lighter streak along the temple; lower parts brown, with a series of blackish blotches on each side, partly on the ventrals, partly on the two lower rows of scales. Total length under 400 mm; tail under 60 mm. (adapted from Boulenger, 1896):

The other three species of snake currently within the genus *Ovophis* Burger, 1981, (namely, *O. monticola* (Günther, 1864) (type species), *O. tonkinensis* (Bourret, 1934) and *O. zayuensis* (Jiang, 1977), the type species being *Trimeresurus monticola* Günther 1864 (including the subgenus described within this paper) are separated from the genus *Ryukyuvipera gen. nov.* and all other Asiatic Pitvipers by the following suite of characters:

The second upper labial shield forms the front part of the facial pit; a pair of small shields behind the rostral. Scales on the head smooth, those of the body slightly but distinctly keeled, in twenty-three dorsal mid-body rows. 137 or more ventrals (vs 129-130 in *Ryukyuvipera gen. nov.*); approximately 41 subcaudals. Males are a blackish ash colour dorsally, females and young are a pale brown; two series of square black spots along the back: the spots of the two series are either placed alternately with each other, or they are confluent into a single series of large quadrangular spots; sides with small, rounded black or brown spots; a white or yellow streak runs from the back edge of the eye to the side of the neck; the middle of the neck with a Y-like yellow or whitish mark, more distinct in the male than in the female; belly densely marbled with brown.

A molecular phylogeny by Pyron *et al.* (2013) showed *Ryukyuvipera gen. nov.* to be most closely related to the Taiwanese genus *Oxyus* Hoser, 2012, but with a divergence estimated at about 7 million years BP or more, warranting division at the genus level.

Distribution: *Ryukyuvipera gen. nov.* is known only from Ryukyu Island, Japan.

Etymology: Named in relation to the location where the genus and species are found.

Content: Monotypic for the species *Ryukyuvipera okinavensis* (Boulenger, 1892).

COTTONVIPERA SUBGEN. NOV.

Type species: *Trimeresurus monticola zayuensis* Jiang, 1977.

Diagnosis: The three species of snake currently within the genus *Ovophis* Burger, 1981, (namely, *O. monticola* (Günther, 1864) (type species), *O. tonkinensis* (Bourret, 1934) and *O. zayuensis* (Jiang, 1977), the type species being *Trimeresurus monticola* Günther 1864 (including the subgenus described within this paper) are separated from the genus *Ryukyuvipera gen. nov.* and all other Asiatic Pitvipers by the following suite of characters:

The second upper labial shield forms the front part of the facial pit; a pair of small shields behind the rostral. Scales on the head smooth, those of the body slightly but distinctly keeled, in twenty-three dorsal mid-body rows. 137 or more ventrals (vs 129-130 in *Ryukyuvipera gen. nov.*); approximately 41 subcaudals. Males are a blackish ash colour dorsally, females and young are a pale brown; two series of square black spots along the back: the spots of the two series are either placed alternately with each other, or they are confluent into a single series of large quadrangular spots; sides with small, rounded black or brown spots; a white or yellow streak runs from the back edge of the eye to the side of the neck; the middle of the neck with a Y-like yellow or whitish mark, more distinct in the male than in the female; belly densely marbled with brown.

The subgenus *Cottonvipera subgen. nov.* is separated from the subgenus *Ovophis* Burger, 1981 by the following suite of characters: the largest supralabial is the third one, whereas in the subgenus *Ovophis* it is the fourth one; the number of ventral scales of the new subgenus is greater than 145, (versus 137-141 in the subgenus *Ovophis*); the subcaudal scales are single or mainly single in the new subgenus, with a few exceptions, whereas in subgenus *Ovophis* these scales are paired or mainly paired, with at most, only a few being single.

Distribution: *Cottonvipera subgen. nov.* is found in Vietnam and nearby China.

The subgenus *Ovophis* is believed to occur in South-east Asia in the area bounded by India/Nepal to the west, Taiwan/Mainland China in the east and Sumatra to the south.

Etymology: *Cottonvipera subgen. nov.* is named in honour of Tom Cotton, of Ringwood, Victoria, Australia in recognition for his excellent work in terms of wildlife research, conservation and education, with the company, Snakebusters, Australia's best reptiles educational shows and displays over a period of nearly a decade predating 2013.

Content: *Ovophis (Cottonvipera) zayuensis* (Jiang, 1977) (type species) and *O. (Cottonvipera) tonkinensis* (Bourret, 1934).

CUMMINGVIPERA GEN. NOV.

Type species: *Trimeresurus kaulbacki* Smith, 1940.

Diagnosis: The genus *Cummingvipera gen. nov.* has until now been placed in the genera *Trimeresurus* Lacépède, 1804, or more recently *Protobothrops* Hoge and Romano-Hoge, 1983. However *Cummingvipera gen. nov.* is separated from all other pitvipers (including others in the two genera *Trimeresurus* and *Protobothrops*) by the following suite of characters: 23-25 dorsal mid-body scale rows; elongate body, head long, massive, with narrow snout; canthus rostralis sharp; a single large, squarish loreal; first upper labial completely separated from nasal by a suture; second upper labial anteriorly bordering facial pit; 8-10 scales in line between supraoculars; supraoculars usually

single, flat, without a vertical projection; dorsally dull grayish or olive green with large, blackish rhombohedral dorsal blotches, either distinct or united to one another; smaller spots on the sides; symmetrical yellow lines on the head; 201-212 ventrals; 66-78 divided subcaudals although some of the anterior scutes may be single, others paired; hemipenes with spines. In total length the males get to 1,340 mm, and females 1,410 mm; with tail length in males to 225 mm, and females to 230 mm.

A molecular phylogeny produced by Pyron *et al.* (2013) showed the genus *Cummingviperea* *gen. nov.* to be most closely related to the genus *Triceratolepidophis* Ziegler *et al.*, 2000.

The genus *Protobothrops sensu lato* (including this new genus) is defined as follows:

Two large solenoglyphic teeth and a loreal pit present; dorsal head covered with very small scales; body and tail elongated, thin and cylindrical; dorsal scales keeled except the outermost; and distinct transverse bands found across the body and tail.

Distribution: Known only from upper Burma and nearby China and India.

Etymology: In honour of leading Australian journalist Fia Cumming, who over a 20 year period was often the only news reporter employed with the mainstream media with the courage to take on the corruption and lies from government officials who sought to outlaw all private ownership of reptiles in Australia.

Without her efforts, including her being the first and main reporter to break the news story of the illegal banning of the book *Smuggled: The Underground Trade in Australia's Wildlife* (Hoser 1993) in May 1993, there would be no person in Australia allowed to have contact with reptiles in any way, save for a handful of privileged persons in government run zoos and the like or similarly protected individuals.

That was the legal situation in most of Australia before the publication of the *Smuggled* books in 1993 and 1996 (Hoser 1993, 1996). See also for the etymology for *Piersonus* Hoser 2009 (type species: *Crotalus ravus* Cope, 1865), in Hoser, 2009.

Content: *Cummingviperea kaulbacki* (Smith, 1940) (type species) and *C. himalayanus* (Pan *et al.* 2013).

CERATRIMERESURUS, LIANG AND LIU IN LIANG, 2003

Type species: *Ceratrimeresurus shenlii* Liang and Liu in Liang, 2003.

Diagnosis: The genus *Ceratrimeresurus* Liang and Liu in Liang, 2003, was originally described as monotypic for the horned viper species *Ceratrimeresurus shenlii* Liang and Liu in Liang, 2003, later synonymized with the species *Protobothrops cornutus* (Smith, 1930), by David *et al.* (2008).

This paper formally recognizes the genus *Ceratrimeresurus* as being distinct from *Protobothrops* and expands it to include two more species, namely, *Trimeresurus jerdonii* Günther, 1875 and *Trimeresurus xiangchengensis* Zhao, Jiang and Huang, 1979.

Snakes within the genus *Ceratrimeresurus* Liang and Liu in Liang, 2003 are separated from other *Protobothrops (sensu lato)* by the following suite of characters, being one or other of the following three combinations of characters:

1/ The presence of a horn-shaped projection on the supraocular and 187-193 ventrals and 71-78 pairs of subcaudals (versus 228-235 ventrals and 79-82 pairs of subcaudals in *Triceratolepidophis sieversorum* Ziegler *et al.* 2000), this being diagnostic for the subgenus *Ceratrimeresurus subgen. nov.*, or:

2/ No horn-shaped projection on the supraocular; the outermost row of dorsal squamae are smooth; 21 or less dorsal mid-body rows; the fourth supralabial squama is separated from subocular by only one squama or no squama; the tip of tail is not orange and is a similar colour to the body colour; snout length a little more than twice the diameter of the eye; head above, except for large internasals and supraoculars, covered by small, unequal, smooth scales that are feebly imbricate or juxtaposed; first labial completely separated from nasal by a suture; internasals separated by 1-2 small scales; 6-9 small scales in line between supraoculars; 7-8 upper labials, third and fourth beneath the eye, in contact with the subocular or separated by at most a single series of small scales; ventrals: Males 164-188, females 167-193; subcaudals all divided: Males 50-78, females 44-76. Total length: Males 835 mm, females 990 mm; tail length: Males 140 mm, females 160 mm, the preceding being diagnostic for *Ceratrimeresurus jerdonii* (Günther, 1875) within the subgenus *Lowryvipera gen. nov.* or:

3/ No horn-shaped projection on the supraocular; the outermost row of dorsal squamae are smooth; 10-12 squamae between supraoculars, 23-25 dorsal mid-body scale rows, 175-194 ventrals, and 44-66 pairs of subcaudals and 7-8 (rarely 9 or 10) supralabial scales; the tip of tail is not orange, and is similar to the body colour; the preceding being for *Ceratrimeresurus xiangchengensis* (Zhao, Jiang and Huang, 1979).

Of note is that the species *Ceratrimeresurus shenlii* Liang and Liu, 2003 was synonymized with *Protobothrops cornutus* (Smith, 1930), by David *et al.* (2008). However a paper by Gong *et al.* 2011 provided molecular evidence to suggest that *Ceratrimeresurus shenlii* Liang and Liu, 2003 may in fact be taxonomically distinct at either subspecies or species level.

The genus *Protobothrops sensu lato* (including the genus *Ceratrimeresurus*) is defined as follows:

Two large solenoglyphic teeth and a loreal pit present; dorsal head covered with very small scales; body and tail elongated, thin and cylindrical; dorsal scales keeled except the outermost; and distinct transverse bands found across body and tail.

Distribution: South-east Asia in the region bound by India/ Nepal in the west, Southern China in the east and Vietnam in the south.

Content: *Ceratrimeresurus cornutus* (Smith, 1930) (the senior species-level synonym for the type species for the genus); *C. jerdonii* (Günther, 1875) and *C. xiangchengensis* (Zhao, Jiang and Huang, 1979).

LOWRYVIPERA SUBGEN. NOV.

Type species: *Trimeresurus jerdonii* Günther, 1875.

Diagnosis: Snakes within the genus *Ceratrimeresurus* Liang and Liu in Liang, 2003 are separated from other *Protobothrops (sensu lato)* by the following suite of characters, being one or other of the following three combinations of characters:

1/ The presence of a horn-shaped projection on the supraocular and 187-193 ventrals and 71-78 pairs of subcaudals (versus 228-235 ventrals and 79-82 pairs of subcaudals in *Triceratolepidophis sieversorum* Ziegler *et al.* 2000), this being diagnostic for the subgenus *Ceratrimeresurus subgen. nov.*, or:

2/ No horn-shaped projection on the supraocular; the outermost row of dorsal squamae are smooth; 21 or less dorsal mid-body scale rows; the fourth supralabial squama is separated from subocular by only one squama or no

squama; the tip of tail is not orange and is similar to the body colour; snout length a little more than twice diameter of eye; head above, except for large internasals and supraoculars, covered by small, unequal, smooth scales that are feebly imbricate or juxtaposed; first labial completely separated from nasal by a suture; internasals separated by 1-2 small scales; 6-9 small scales in line between supraoculars; 7-8 upper labials, third and fourth beneath the eye, in contact with the subocular or separated by at most a single series of small scales; ventrals: Males 164-188, females 167-193; subcaudals all divided: Males 50-78, females 44-76. Total length: Males 835 mm, females 990 mm; tail length: Males 140 mm, females 160 mm being diagnostic for *Ceratrimeresurus jerdonii* (Günther, 1875) within the subgenus *Lowryvipera gen. nov.* or:

3/ No horn-shaped projection on the supraocular; the outermost row of dorsal squamae are smooth; 10-12 squamae between supraoculars, 23-25 dorsal mid-body scale rows, 175-194 ventrals, and 44-66 pairs of subcaudals and 7-8 (rarely 9 or 10) supralabial scales; the tip of tail is not orange and is similar to the body colour; this being diagnostic for *Ceratrimeresurus xiangchengensis* (Zhao, Jiang and Huang, 1979), within the subgenus *Lowryvipera gen. nov.* The diagnosis for the nominate subgenus *Ceratrimeresurus* Liang and Liu in Liang, 2003 is effectively contained within this diagnosis.

The diagnosis for *Lowryvipera gen. nov.* is encapsulated within 2 and 3 above, being the diagnosis for the two component species.

The genus *Protobothrops sensu lato* (including the genus *Ceratrimeresurus*) is defined as follows:

Two large solenoglyphic teeth and a loreal pit present; dorsal head covered with very small scales; body and tail elongated, thin and cylindrical; dorsal scales are keeled except the outermost; and distinct transverse bands found across the body and tail.

Distribution: South-east Asia in the region bound by India/Nepal in the west, Southern China in the east and Vietnam in the south.

The nominate subgenus *Ceratrimeresurus* is restricted to North Vietnam and nearby Southern China and presently only known from a limited number of specimens.

Etymology: Named in honour of Andrew Lowry, a herpetologist formerly from Mentone, Victoria, Australia, now living in Cheltenham, Victoria, Australia in recognition for his largely unrecognized contributions to herpetology in Australia, in particular that relating to venomous elapid snakes (Elapidae).

Content: *Ceratrimeresurus (Lowryvipera) jerdonii* (Günther, 1875) (type for subgenus) and *C. (Lowryvipera) xiangchengensis* (Zhao, Jiang and Huang, 1979).

CROTTYVIPERA GEN. NOV.

Type species: *Trionocephalus mucrosquamatus* Cantor, 1839.

Diagnosis: *Crottyvipera gen. nov.* is separated from all other *Protobothrops sensu lato* and diagnosed as follows: one or other of:

Rostral slightly broader than deep; nasal divided or semidivided; upper head-scales extremely small, granular, smooth or obtusely keeled; supraocular large, or rather narrow; 2 or 3 scales separating

the internasals in front; 10 to 15 scales on a line between the supraoculars; three to five minute postoculars and a subocular, which is separated from the labials by one, two, or

three series of scales; temporal scales smooth; 7 to 11 upper labials, second forming the anterior border of the loreal pit. Scales strongly keeled, in 25 or 27 rows. Ventrals 183-218; anal entire; subcaudals 72-92 pairs. Brownish grey above, with a dorsal series of large blackish spots and a lateral series of smaller ones; a blackish streak from the eye to the angle of the mouth; lower parts brownish, spotted with white, being diagnostic for *Crottyvipera mucrosquamatus* (Cantor, 1839), or:

Rostral broader than deep; nasal divided; upper head-scales very small, flat, juxtaposed, smooth on the snout and vertex; supraocular large; no internasals; 12 or 13 scales on a line between the supraoculars; two or three small postoculars and a subocular, which is separated from the labials by two series of scales; temporal scales keeled; 7 or 8 upper labials, second forming the anterior border of the loreal pit, third and fourth large. Scales strongly keeled, in 23 or 25 mid-body rows. Ventrals 181-186; anal entire; subcaudals 72-74. Yellow above, with a dorsal series of rhomboidal dark, black-edged spots partly confluent into a zigzag band; a lateral series of small spots; a blackish streak on each side of the head behind the eye; yellowish beneath, spotted and clouded with grey being diagnostic for *Crottyvipera elegans* (Gray, 1849).

The genus *Protobothrops sensu lato* (including the genus *Crottyvipera gen. nov.*) is further defined as follows:

Two large solenoglyphic teeth and a loreal pit present; dorsal head covered with very small scales; body and tail elongated, thin and cylindrical; dorsal scale keeled except the outermost; and distinct transverse bands found across body and tail.

Distribution: Southern Asia from India to Southern China and including Taiwan and Ryukyu Island, Japan and including Bangladesh, Burma and Vietnam, but not including Malaysia/Indonesia or the Philippines.

Etymology: Named after a pet Great Dane/Rottweiler Cross (named himself in honour of the Pitviper genus *Crotalus* Linnaeus, 1758) who guarded the house and research facility of our family from 1989 to 2001 from break-ins and thefts.

In reference to a large number of "hate posts" on internet chat forums by so-called "Twitter taxonomists" Mark O'Shea, Darren Naish and Wolfgang Wüster of the UK, I make no apologies for naming a genus of snake in honour of a four-legged co-inhabitant of our wonderful and biodiverse planet. By the way, "Twitter", "Facebook" and "Wikipedia" are NOT peer reviewed scientific publications!

Content: *Crottyvipera mucrosquamatus* (Cantor, 1839) (type species); *C. elegans* (Gray, 1849).

SWILEVIPERA GEN. NOV.

Type species: *Bothrops hageni* Lidth De Juede, 1886.

Diagnosis: The genus *Swilevipera gen. nov.* was until now included within *Parias*, Gray, 1849.

However it is readily separated from this genus by the fact that the fifth supralabial scale is separated from the subocular by a scale and a lack of dorsal cross-bands. This is not the case in *Parias* species. *Swilevipera gen. nov.* usually lacks an internasal, whereas this is usually present in *Parias* species. *Swilevipera gen. nov.* also has fewer supralabials in contact with the subocular scale than is seen in *Parias* species (Sanders *et al.* 2002).

Both the species *Swilevipera hageni* (Lidth De Juede, 1886) and the morphologically similar species *Parias sumatranus* (Raffles, 1822) are separated from all other south and south-east Asian species of pitviper by the following suite of characters:

Head rather elongate. Rostral as deep as broad or a little broader than deep; the nasal is entire or divided; upper head-scales rather large, flat, smooth, imbricate or subimbricate, largest on the snout, 4 to 9 in a transverse series between the supraoculars, which are large; two or three postoculars and a subocular, which is in contact with the third or third and fourth labials (and fifth in *P. sumatranus*, and not fifth in *S. hageni*); temporal scales smooth; 9 to 11 upper labials, second forming the anterior border of the loreal pit, third largest. Scales feebly keeled, in 21 dorsal mid-body rows. Ventrals 180-191; anal entire; subcaudals 58-82. Tail prehensile. Colour is a bright green above, the scales usually black-edged, with or without black cross-bands (with in *P. sumatranus*, and without in *S. hageni*); two series of small whitish spots may be present along the back; a more or less distinct whitish or yellow streak is usually present on each side, along the outer row of scales; ventrals yellowish or green, with or without fine black edges; end of the tail is red.

Distribution: Currently only known from Peninsula Malaysia, Singapore, Southern Thailand and Sumatra.

Etymology: Named in honour of Benjamin Swile of Athlone, Cape Town, South Africa, in recognition for his contributions to the herpetology of South Africa.

Content: Monotypic for *Swilevipera hageni* (Lidth De Juede, 1886).

SIMPSONVIPERA SUBGEN. NOV.

Type species: *Trimeresurus medoensis* Zhao, 1977.

Currently most widely known as *Viridovipera medoensis* (Zhao, 1977).

Diagnosis: This subgenus *Simpsonvipera subgen. nov.* within *Viridovipera* is separated from the rest of the genus and other Asian pitvipers by the following suite of characters: 17 dorsal mid-body scale rows, dorsal rows 7-11 slightly keeled; 8 upper labials, first upper labials separated from nasals by a distinct suture; green or bluish green above, yellowish white below, the two separated by a bright bicolored red (below) and white (above) ventrolateral stripe (in both males and females), which occupies the whole of the outermost scale row and a portion of the second row; ventrals less than 150; hemipenes short, thick and spinose. Total length in males is 671 mm, females 650 mm; tail length in males is 125 mm, females 115 mm.

Distribution: Burma, east India and Tibet (China).

Etymology: Named in honour of Neil Simpson of East Hills, of Sydney, New South Wales, Australia for a valuable contribution to Australian herpetology spanning two decades, including for a short time, a fantastically well-produced magazine publication called *Reptiles Australasia*.

Content: Monotypic for the species *Viridovipera (Simpsonvipera) medoensis* (Zhao, 1977).

YUNNANVIPERA SUBGEN. NOV.

Type species: *Trimeresurus yunnanensis* Schmidt, 1925.

Currently most widely known as *Viridovipera yunnanensis* (Schmidt, 1925).

Diagnosis: *Yunnanvipera subgen. nov.* is monotypic for the species *Viridovipera (Yunnanvipera) yunnanensis* Schmidt, 1925. It is separated from all other *Viridovipera* and all other Asian pitvipers by the following suite of characters: 19 or rarely 21 dorsal mid-body rows and 19 or rarely 21 rows on the neck; 9-10 (rarely 11) upper labials, first upper labials are separated from nasals by a distinct suture; a single narrow supraocular, sometimes divided by a transverse suture; 11-16 scales in a line between the supraoculars; the colour above is bright to dark green, below the colour is pale green

to whitish, the two separated by a bicolored orange or brown (below) and white (above) in males, or white only or absent in females, ventrolateral stripe, which occupies the whole of the outermost scale row and a portion of the second row; ventrals 155-165, rarely to 170; subcaudals 58-68, all divided; hemipenes short and spinose beyond the bifurcation. Total length to 750 mm, tail length to 145 mm.

Distribution: Known only from Southern China (Yunnan and southwestern Sichuan), at elevations up to 2,845 metres.

Etymology: Named in reflection of the type locality Tengyueh, Yunnan, China.

Content: Monotypic for the species *Viridovipera (Yunnanvipera) yunnanensis* (Schmidt, 1925).

BORNEOVIPERA SUBGEN. NOV.

Type species: *Atropophis borneensis* Peters, 1872.

Currently widely known as either *Craspedocephalus borneensis* (Peters, 1872) or *Trimeresurus borneensis* (Peters, 1872)

Diagnosis: *Borneovipera subgen. nov.* are separated from all other *Craspedocephalus* and all other Asian pitvipers by the following suite of characters:

(1) an overall grey, brown or ochre pattern with 20-30 darker crossbands, distinctly related to the sex: in males, background colour in various shades of greyish-brown or yellowish-grey, with darker dorsolateral blotches, sometimes horizontally divided into two distinct blotches, separated darker areas and powdered with both cream and dark dots, giving a rather confused pattern; in females, pattern less contrasted, in shades of ochre or yellowish-brown with more or less brown subrectangular dorsolateral blotches, often with broad darker edges and a wide lighter centre, producing a "saddle-like" pattern; males have a more complex pattern, but are especially much darker than females; (2) a distinctly projected and raised snout, strongly obliquely truncated when seen from the side, subrectangular seen from above (as opposed to a short obliquely truncate snout in snakes of the *Craspedocephalus puniceus* complex)(subgenus *Craspedocephalus*); (3) internasals projected, strongly spatulate and bilobate, distinctly upturned; (4) 19 or usually 21 (rarely 20) dorsal mid-body scale rows; (5) first supralabial distinct from nasal; (6) Second supralabials bordering the whole of the anterior margin of the loreal pit; (7) 1 to 3 moderate, narrow supraoculars, usually flat, rarely convex; (8) 149-166 ventrals, 41-67 subcaudals; (9) occipital and temporal scales distinctly keeled in both sexes in adults, less so in juvenile specimens; (10) IL of the first pair not in contact each with the other; (11) hemipenes short, reaching the eleventh subcaudal, entirely spinose; and (12) adult females usually light colored (13) In *Borneovipera subgen. nov.* the second supralabial borders the loreal pit, as opposed to not so in the morphologically similar *Craspedocephalus puniceus* complex (subgenus *Craspedocephalus*). (14) In *Borneovipera subgen. nov.* there are 1 to 3 moderate, narrow supraoculars, usually flat, rarely convex, whereas in the *Craspedocephalus puniceus* complex there are 2 to 5 small, distinctly raised supraoculars.

Distribution: Borneo, Sumatra, West Malaysia and Thailand.

Etymology: Named in reflection of the type locality Sarawak, on the island of Borneo, East Malaysia.

Content: *Craspedocephalus (Borneovipera) borneensis* (Peters, 1872) (type species); *C. (Borneovipera) andalasensis* (David, Vogel, Vijayakumar and Vidal 2006), *C. (Borneovipera) brongersmai* (Hoge, 1969); *C. (Borneovipera) wiroti* (Trutnau, 1981).

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CONFLICT OF INTEREST

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



ARRANGEMENT OF GENERA WITHIN THE FAMILY VIPERIDAE OPPEL, 1811**(Terminal Taxon: *Vipera aspis*)****SUBFAMILY VIPERINAE OPPEL, 1811 (PITLESS VIPERS)****(Terminal Taxon: *Vipera aspis*)**

Content: See for each tribe.

Tribe Atherini Groombridge 1986

(Terminal Taxon: *Atheris chlorechis*)Content: *Adenorhinos* Marx and Rabb, 1965; *Atheris* Cope, 1862; *Montatheris* Broadley, 1996; *Proatheris* Broadley, 1996.

Tribe Bitisini Hoser, 2012

(Terminal Taxon: *Bitis arietans*)Content: *Bitis* Gray, 1842 (including all six subgenera as defined by Hoser (2013c).

Tribe Causini Cope 1860

(Terminal Taxon: *Causus maculatus*)Content: *Causus* Wagler, 1830.

Tribe Cerastini Hoser, 2012

(Terminal Taxon: *Cerastes cerastes*)Content: *Cerastes* Laurenti, 1768.

Tribe Echiini Hoser, 2012

(Terminal Taxon: *Echis carinatus*)Content: *Echis* Merrem, 1820.

Tribe Proatherini Hoser, 2012

(Terminal Taxon: *Proatheris superciliaris*)Content: *Proatheris* Broadley, 1996.The genus is monotypic for the species: *Proatheris superciliaris*.

Tribe Pseudocerastini Hoser, 2012

(Terminal Taxon: *Pseudocerastes persicus*)Content: *Eristicophis* Alcock and Finn, 1897; *Pseudocerastes* Boulenger, 1896.

Subtribe Pseudocerastina Hoser, 2012

(Terminal Taxon: *Pseudocerastes persicus*)Content: *Pseudocerastes* Boulenger, 1896.

Subtribe Eristicophina Hoser, 2012

(Terminal Taxon: *Eristicophis macmahonii*)Content: *Eristicophis* Alcock and Finn, 1897.

Tribe Viperini Laurenti, 1768.

(Terminal Taxon: *Vipera aspis*)Content: *Daboia* Gray 1842; *Maxhoservipera* Hoser, 2012; *Macrovipera* Reuss, 1927; *Montivipera* Nilson et. al., 1999; *Vipera* Laurenti, 1768.

Subtribe Maxhoserviperina Hoser, 2012

(Terminal Taxon: *Maxhoservipera palaestinae*)Content: *Daboia* Gray, 1842; *Maxhoservipera* Hoser, 2012.

Subtribe Montiviperina Hoser, 2012

(Terminal Taxon: *Montivipera xanthina*)Content: *Macrovipera* Reuss, 1927; *Montivipera* Nilson et. al., 1999.

Subtribe Viperina Laurenti, 1768.

(Terminal Taxon: *Vipera aspis*)Content: *Vipera* Laurenti, 1768.

SUBFAMILY AZEMIOPINAE LIEM, MARX AND RABB, 1971**(Terminal Taxon: *Azemiops feae*)**Content: *Azemiops* Boulenger, 1888.

Tribe Azemiopini Liem, Marx and Rabb 1971.

(Terminal Taxon: *Azemiops feae*)Content: *Azemiops* Boulenger, 1888.**SUBFAMILY CALLOSELASMIINI FAM. NOV.****(Terminal taxon: *Calloselasma rhodostoma*)**Content: *Calloselasma* Cope, 1860; *Hypnale* Fitzinger, 1843.

Tribe Calloselasmiini Hoser, 2013

(Terminal taxon: *Calloselasma rhodostoma*)Content: *Calloselasma* Cope, 1860; *Hypnale* Fitzinger, 1843.**SUBFAMILY TROPIDOLAEMUSIINAE FAM. NOV.****(Terminal taxon: *Tropidolaemus wagleri*)**Content: *Deinagkistrodon* Gloyd, 1979; *Garthius* Malhorta and Thorpe, 2004; *Sloppvipera* gen. nov. (this paper); *Tropidolaemus* Wagler, 1830.

Tribe Tropidolaemusini Hoser, 2012

(Terminal taxon: *Tropidolaemus wagleri*)Content: *Deinagkistrodon* Gloyd, 1979; *Garthius* Malhorta and Thorpe, 2004; *Sloppvipera* gen. nov. (this paper); *Tropidolaemus* Wagler, 1830.**SUBFAMILY - CROTALINAE OPPEL, 1811 (PITVIPERS)****(Terminal Taxon *Crotalus horridus*)**

Content: See for each tribe.

Tribe Adelynhoserserpenini Hoser, 2012

(Terminal Taxon: *Adelynhoserserpenae nummifer*)Content: *Adelynhoserserpenae* Hoser, 2012; *Atropoides* Werman, 1992; *Cerrophodion* Campbell and Lamar, 1992; *Porthidium* Cope, 1871.

Subtribe Porthidiumina Hoser, 2012

(Terminal Taxon: *Porthidium ophryomegas*)Content: *Porthidium* Cope, 1871.

Subtribe Cerrophodionina Hoser, 2012

(Terminal Taxon: *Cerrophodion godmanni*)Content: *Cerrophodion* Campbell and Lamar, 1992; *Atropoides* Werman, 1992.

Subtribe Adelynhoserserpenina Hoser, 2012

(Terminal Taxon: *Adelynhoserserpenae nummifer*)Content: *Adelynhoserserpenae* Hoser, 2012.

Tribe Akistrodonini Hoser, 2012

(Terminal Taxon *Agkistrodon contortrix*)Content: *Agkistrodon* Palisot de Beauvois, 1799.

Tribe Crotalini Gray, 1825

(Terminal Taxon *Crotalus horridus*)Content: *Aechmophrys* Coues, 1875; *Caudisona* Laurenti, 1768; *Crotalus* Linnaeus, 1758; *Cummingea*, Hoser 2009; *Hoserea* Hoser, 2009; *Mattea* Hoser, 2009; *Piersonus* Hoser, 2009; *Sistrurus* Garman, 1883; *Uropsophus* Wagler, 1830.

Subtribe Crotalina Hoser, 2012**(Terminal Taxon *Crotalus horridus*)****Content:** *Aechmophrys* Coues, 1875; *Caudisona* Laurenti, 1768; *Crotalus Linnaeus*, 1758; *Cummingea*, Hoser 2009; *Hoserea* Hoser, 2009; *Matteoa* Hoser, 2009; *Sistrurus* Garman, 1883; *Uropsophus* Wagler, 1830.**Subtribe Piersonina Hoser, 2012****(Terminal Taxon *Piersonus ravidus*)****Content:** *Piersonus* Hoser, 2009.**Tribe Jackyhoserini Hoser, 2012****(Terminal Taxon: *Jackyhoserea pictus*)****Content:** *Bothriopsis* Peters, 1861; *Bothrocophias* Cutberlet and Cambell, 2001; *Bothropoides* Fenwick, et. al., 2009; *Bothrops* Wagler, 1824; *Jackyhoserea* Hoser, 2012; *Rhinocerophis* Garman, 1881.**Subtribe Bothropina Hoser, 2012****(Terminal Taxon: *Bothrops lanceolatus*)****Content:** *Bothriopsis* Peters, 1861; *Bothrops* Wagler, 1824.**Subtribe Bothropoidina Hoser, 2012****(Terminal Taxon: *Bothropoides neuwiedi*)****Content:** *Bothropoides* Fenwick, et. al. 2009.**Subtribe Rhinocerophiina Hoser, 2012****(Terminal Taxon: *Rhinocerophis nasus*)****Content:** *Rhinocerophis* Garman, 1881.**Subtribe Jackyhoserina Hoser, 2012****(Terminal Taxon: *Jackyhoserea pictus*)****Content:** *Jackyhoserea* Hoser, 2012 (See Hoser 2012c).**Subtribe Bothrocophiina Hoser, 2012****(Terminal Taxon: *Bothrocophias hyopora*)****Content:** *Bothrocophias* Cutberlet and Cambell, 2001.**Tribe Lachesini Cope, 1900.****(Terminal Taxon *Lachesis muta*)****Content:** *Bothriechis* Peters, 1859; *Lachesis* Daudin, 1803; *Ophryacus* Cope, 1887; *Teleuraspis* Cope, 1860.**Subtribe Bothriechisina Hoser, 2012****(Terminal Taxon *Bothriechis nigroviridis*)****Content:** *Bothriechis* Peters, 1859; *Teleuraspis* Cope, 1860.**Tribe Lachesina Cope 1900.****(Terminal Taxon *Lachesis muta*)****Content:** *Lachesis* Daudin, 1803; *Ophryacus* Cope, 1887.**Tribe Trimeresurusini Hoser, 2012****(Terminal Taxon: *Trimeresurus gramineus*)****Content:** *Adelynhoserea* Hoser, 2012; *Ceratrimeresurus* Liang and Liu in Liang, 2003; *Conantvipera* gen. nov. (this paper); *Craspedocephalus* Kuhl and van Hasselt, 1822; *Crottyvipera* gen. nov. (this paper); *Cryptelytrops* Cope, 1860; *Cummingvipera* gen. nov. (this paper); *Gloydus* Hoge and Romano-Hoge, 1981; *Himalayophis* Malhorta and Thorpe, 2004; *Katrinahoservipera* gen. nov. (this paper); *Ninvipera* gen. nov. (this paper); *Ovophis* Burger, 1981; *Oxyus* Hoser, 2012; *Parias* Gray, 1849; *Peltopelor* Günther, 1864; *Popeia* Malhorta and Thorpe, 2004; *Protobothrops* Hoge and Romano-Hoge, 1983; *Ryukyuvipera* gen. nov. (this paper); *Swilevipera* gen. nov. (this paper); *Triceratolepidophis* Ziegler et al., 2000; *Trimeresurus* Lacépède, 1804; *Viridovipera* Malhorta and Thorpe, 2004; *Zhaoermia* Zhang, 1993.