

Further division of the tree snake genus *Dendrelaphis* Boulenger, 1890, including the erection of three new genera to accommodate divergent species groups (Serpentes: Charlespiersonserpeniidae).

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ABSTRACT

The tree Snake genus *Dendrelaphis* Boulenger, 1890 as recognized at the beginning of year 2012 had long been recognized as a diverse group (McDowell 1984).

Hoser (2012), commenced the dismemberment of the genus as widely known by removing several distinctive Australasian species and placing them in the new genus *Charlespiersonserpens*.

Hoser 2013 went further and created a new family Charlespiersonserpeniidae to accommodate the Colubroid snake genera *Charlespiersonserpens* Hoser, 2012, *Dendrelaphis* Boulenger, 1890, *Chrysopelea* Boie, 1826 and *Ahaetulla* Link, 1807, in turn placed within tribes.

Phylogenies published by Pyron *et al.* (2013a, 2013b) provided molecular evidence in support of the Hoser (2012 and 2013) divisions of *Dendrelaphis* and the higher level taxonomy as well as other earlier morphological studies (e.g. Boulenger 1890).

This paper now takes the next logical step in the dismemberment of the genus *Dendrelaphis* and removes divergent Asian species groups from *Dendrelaphis sensu lato* creating three new genera, namely *Dannycoleus gen. nov.* for the *bifrenalis* group, *Shaneblackus gen. nov.* for the *pictus* group and *Brucegowus gen. nov.* for the *caudolineolatus* group, all placed within the tribe Charlespiersonserpenini Hoser, 2013.

Keywords: Taxonomy; Tree Snakes; Charlespiersonserpeniidae; Charlespiersonserpenini; *Dendrelaphis*; *Charlespiersonserpens*; new genera; *Dannycoleus*; *Brucegowus*; *Shaneblackus*.

INTRODUCTION

The tree Snake genus *Dendrelaphis* Boulenger 1890 as popularly recognized at the start of year 2012 had long been recognized as a diverse group (McDowell 1984).

Notwithstanding the anatomical differences between members within the genus as understood by McDowell (1984), the undeniable fact in terms of these snakes is the similar morphology and habits of most members within the genus as defined.

As of 2012 the genus stood at in excess of 40 recognized species including a number of distinct species groups.

Hoser (2012), commenced the dismemberment of the genus as widely known by removing several distinctive Australasian species and placing them in the new genus

Charlespiersonserpens Hoser, 2012 in turn broken up into subgenera, based on morphological differences.

Hoser 2013 went further and created a new family Charlespiersonserpeniidae Hoser, 2013 to accommodate the Colubroid snake genera *Charlespiersonserpens* Hoser, 2012, *Dendrelaphis* Boulenger, 1890, *Chrysopelea* Boie, 1826 and

Ahaetulla Link, 1807, in turn placed within tribes, the tribe Charlespiersonserpenini Hoser, 2013 effectively including all species until then placed within the genus *Dendrelaphis* Boulenger, 1890 (and including *Charlespiersonserpens* Hoser, 2012).

A phylogeny published by Pyron *et al.* in 2013 (Pyron *et al.* 2013a) provided molecular evidence in support of the Hoser (2012 and 2013) division of *Dendrelaphis*.

The divisions indicated in the phylogeny of Pyron *et al.* (2013a) based on molecular evidence are also corroborated by the morphological divergence of the relevant species as noted as far back as 1890 by Boulenger (1890), who divided relevant species between two genera (*Dendrophis* Smith, 1840 and *Dendrelaphis* Boulenger, 1890).

As a result of the convergence of data, both morphological and molecular, pointing to the same obvious position, this paper now removes three divergent Asian species groups from *Dendrelaphis sensu lato* (AKA Charlespiersonserpenini Hoser, 2013), creating three new genera, namely *Dannycoleus gen. nov.* for the *bifrenalis* group, *Shaneblackus gen. nov.* for the

pictus group and *Bucegowus* *gen. nov.* for the *caudolineolatus* group, all placed within the tribe Charlepiersonserpenini Hoser, 2013, with all defined according to the Zoological Code (Ride *et al.* 1999).

Along with the genera *Dendrelaphis* and *Charlespiersonserpens*, these are all placed within the tribe Charlepiersonserpenini Hoser, 2013 as defined by Hoser (2013).

Hoser (2012) provided an extensive list of references relevant to the snakes of the genus *Dendrelaphis sensu lato* and their taxonomy, including the newly erected genus *Charlespiersonserpens*.

Although it has already been inferred that molecular data of Pyron *et al.* (2013) supports the erection of the three genera as defined below, I should note that the genera are defined solely on the basis of morphological divergence rather than any phylogenies produced on the basis of molecular data.

The body of literature and published in relation to the genus *Dendrelaphis* as widely recognized at start 2012, including Charlespiersonserpens Hoser (2012) as defined by Hoser (2012) is large. Key publications including those relevant to the species dealt with in this paper include, Anderson (1871), Auffenberg (1980), Auliya (2006), Baier (2005), Bergman (1955), Boie (1827), Boulenger (1886, 1888, 1890, 1894, 1895a, 1895b, 1897), Bourret (1935), Cohn (1905), Cox *et al.* (1998), Das (1999), Das and De Silva (2005), Daudin (1803), David and Vogel (1996), de Lang and Vogel (2005), de Rooij (1917), Deuve (1970), Devan-Song and Brown (2012), Doria (1817), Duméril *et al.* (1854), Flower (1897, 1899), Frith (1977), Gadow (1909), Garman (1901), Gaulke (1994, 1999), Gaulke *et al.* (1993), Gmelin (1789), Gray (1825, 1826, 1835, 1841, 1842), Grismer *et al.* (2008), Günther (1858, 1867, 1872), Hoser (1989, 2012, 2013), How and Kitchner (1997), How *et al.* (1996), Iskandar and Colijn (2002), Janzen *et al.* (2007), Koch (2011), Kuhl (1820), Lazell (2002), Lazell and Wu (1990), Leviton (1970), Lim and Cheong (2011), Lim and Lim (1992), Lim and Ng (1999), Lidth De Jeude (1911), Loveridge (1948), Luard (1918), Macleay (1875, 1877, 1878, 1884), Malkmus *et al.* (2002), Manthey and Grossmann (1997), McCoy (2006), McDowell (1984), McKay (2006), Meise and Hennig (1932), Mertens (1926, 1927, 1930), Obst (1977), Pyron *et al.* (2011, 2013a, 2013b), Schmidt (1932), Sharma (2004), Smith (1943), Stejneger (1933), Sudasinghe (2010), Taylor (1950), Thompson and Thompson (2008), Tiwari and Biswass (1973), Tweedie (1983), van Rooijen and van Rooijen (2007), van Rooijen and Vogel (2008a, 2008b, 2008c, 2009, 2010), Vidal *et al.* (2007), Vijayakumar and David (2006), Vogel (1995), Vogel and van Rooijen (2007, 2008, 2011a, 2011b, 2011c), Wall (1908, 1910, 1913, 1921a, 1921b), Wells and Wellington (1985), Werner (1893), Whittaker and Captain (2004), Whittaker *et al.* (1982), Zeigler and Vogel (1999) and Zhao and Adler (1993).

GENUS DENDRELAPHIS BOULENGER, 1890

Type species: *Ahaetulla caudolineata* Gray, 1834.

Diagnosis: The so-called tree snakes or bronzebacks are a group of over 20 moderate-to-large diurnal species found in the region from India across Southern Asia into Australia. Most described species come from south-east Asia.

As a group, they have been of taxonomic interest in the last two decades with numerous new species described by Vogel, Van Rooijen and others.

All are similar in build and habits, being generally slender, slightly laterally compressed with long-whip-like tails, head barely distinct from the neck and a large eye with a round pupil. The ventrals exhibit a sharp ridge running down either side presenting an "arch-shape" in cross section which enables traction when climbing trees and the like.

Color varies strongly between species and within wide-ranging species also varies depending on locality. Scalation is smooth, with apical pits, there are usually 13 dorsal mid-body scale rows, arranged obliquely.

When threatened, snakes will puff up their neck and fore-body, swelling it vertically, often yielding different colored skin between the now parted scales.

At the genus level the group has been relatively stable in recent years in spite of the growing number of named species.

The type species, the Striped Bronzeback *Dendrelaphis caudolineatus* (Gray, 1834) is physically quite different from the Australia/New Guinea species, being of obviously thinner build and glossier scalation.

These snakes were separated into three groups by McDowell 1984, based on hemipenal morphology and other attributes deemed herein as significant differences necessitating taxonomic recognition.

As a result of these obvious differences, seven Australia/New Guinea species, were placed in the newly created genus for all seven species called *Charlespiersonserpens* Hoser, 2012.

Three of these species were further placed within newly named subgenera, one subgenus *Downieea* Hoser, 2012 included one species *papuenis*, while the other subgenus, *Macmillanus* Hoser, 2012 included the species *lorentzi* and a newly described congener, *Charlespiersonserpens (Macmillanus) jackyhoserae* Hoser, 2012.

Hoser, 2012, stated "*Dendrelaphis* as herein recognized is certainly composite and warranting further divisions at the subgenus level". This paper moves further in this regard, choosing to give full generic status to the three groups named herein.

The remaining content of the genus *Dendrelaphis* is given below after the descriptions of the other new genera. It is a genus of snakes distributed in Southern Asia and nearby. That assemblage is also likely to be further divided with groups within it requiring further taxonomic recognition.

GENUS CHARLESPIERSONSERPENS HOSER, 2012

Type Species: *Leptophis punctulatus* Gray, 1826

Diagnosis: A group of snakes separated from other *Dendrelaphis* by their generally heavier build (like-for-like) and slightly less glossy dorsal body shields (at same point of shedding cycle).

The following suite of characters identifies this genus: Variable dorsal colour, slightly lighter laterally, but all lack longitudinal black stripes on all or most of their body, labials and throat pale, 13 dorsal mid-body scale rows, all smooth and arranged obliquely, 156-221 ventrals, divided anal, 118-160 divided subcaudals, loreal present, 8-9 supralabials, with fourth and fifth or fifth and sixth in contact with the eye, 1 pre-ocular, 2 or 3 postoculars and have a medium or short hemipenis that doesn't extend past the fifteenth subcaudal.

Snakes within the genus *Dendrelaphis* have a higher average ventral count than seen in this genus *Charlespiersonserpens* Hoser, 2012.

Furthermore for snakes within the genus *Dendrelaphis* only the fourth supralabial makes contact with the eye, with numbers 5 and 6 merely coming close, as opposed to the configuration given above for *Charlespiersonserpens* Hoser, 2012.

Noteworthy is that two species within this genus, namely *papuenis* (Boulenger 1895) and *salomonis* (Günther, 1872) were in 1984 resurrected from synonymy with *punctulatus* and/or *calligastra* by McDowell in 1984, and again by Wells and Wellington in 1985, which has been upheld by later studies.

Distribution: The Australian/Papuan region of the Sahul Shelf.

Content: *Charlespiersonserpens punctulatus* (Gray, 1826) (type species); *C. calligastra* (Günther, 1867); *C. gastrosticus* (Boulenger, 1894); *C. (Macmillanus) jackyhoserae* Hoser, 2012; *C. (Macmillanus) lorentzi* (Lidth De Jeude, 1911); *C. (Downieea) papuensis* (Boulenger, 1895); *C. salomonis* (Günther, 1872).

DANNYCOLEUS GEN. NOV.

Type species: *Dendrophis bifrenalis* Boulenger, 1890.

Diagnosis: This genus *Dannycoleus gen. nov.* is readily separated from other similar species by having a double loreal shield, which is unique within the tribe Charlepiersonserpenini.

These species are also separated from all other *Dendrelaphis* species (as diagnosed herein), excluding *Shaneblackus gen. nov.* (see below) by having a red colored tongue, which is not the case in all other species in the tribe Charlepiersonserpenini.

The genus *Dannycoleus gen. nov.* is readily separated from *Shaneblackus gen. nov.* (see below) by having a noticeably more elongate head as well as the fact that in *Dannycoleus gen. nov.* the whole side of the ventrals above the lateral keel is a dark olive colour like on the back.

Dannycoleus gen. nov. is also diagnosed as follows: Cylindrical, narrow, slender body is present with a dorso-ventrally flattened pear shaped head. The neck region is clear and distinct. The snout is long and compressed and the tip is broad and rounded. The nostrils are laterally oriented and rounded in shape. The pupil is round and the eyes large.

Parietals are longer than the frontal, two loreals, nine upper labials, numbers five and six entering the eye; 154-171 ventrals, divided anal and 144-155 divided subcaudals.

The prehensile tail is 1/3 of the total length of the snake. Dorsally the snake is a copper color. The top of the labials and chin are a cream or light green color. There is a black broad bar at the sides of the head and these run along the eye to the neck region. The lateral corner of the anterior body has black cross strips in a diagonal angle. Two yellow lines run on the lateral sides of the body. Sometimes these lines may be margined by black dots. Ventrally the colour is a yellowish green. Adult snakes grow to about 700-900mm total length. There are 15 dorsal mid-body rows of scales. The vertebrals are clear and enlarged and larger than the outer row.

Distribution: Sri Lanka and possibly southern India.

Etymology: Named in honour of Danny Cole a lawyer and Barrister from Melbourne, Victoria, Australia in recognition of his important pro-bono (free) public interest legal work as a barrister, defending wrongly charged corruption whistleblowers against criminal charges laid by corrupt government employees.

Also in recognition for his own earlier whistle blowing activity in terms of blowing the lid on malpractice at the Victorian Department of Human Services, where he worked at the time.

Content: *Dannycoleus bifrenalis* (Boulenger, 1890) (type species); *D. girii* (Vogel and Van Rooijen, 2011).

SHANEBLACKUS GEN. NOV.

Type species: *Coluber pictus* Gmelin, 1789.

Diagnosis: *Shaneblackus gen. nov.* is diagnosed and separated from all other *Dendrelaphis* (and including *Dannycoleus gen. nov.*, *Brucegowus gen. nov.* and *Charlespiersonserpens* Hoser, 2012) as follows: The maxillary teeth number from 23 to 26, the eye is as long as the distance between the nostril and eye. The rostral scale is more broad than deep, and is visible from above. Internasal scales are as long as, or slightly shorter than, the praefrontal scales. The frontal scale is as long as its distance from the rostral or the tip of the snout, but shorter than the parietal scales. The loreal is long and there is one preocular and two postoculars. The temporal scales are 2+2, 1+1, or 1+2. There are usually nine (or rarely seven or eight) upper labials, with the fifth and sixth (or fourth to sixth) entering the eye. This snake has five (rarely four) lower labials in contact with the anterior chin shields the latter shorter than the posterior, which are separated by one anterior and two posterior scales. Scales are in 15 rows, the vertebrals are about as large as the outer scales (which is different to that seen in *Dannycoleus gen. nov.* where they are noticeably clear and enlarged); Ventrals number 151-204, the anal scale is usually, but not always divided, and the divided subcaudals number 103-174. The snake's

colouration is olive or brown above with a yellow lateral stripe, bordered below by a dark line between the outer scales and the ventrals. A black temporal stripe on each side of the head passes through the eye, widens or breaks up into spots, separated by bluish-green bands on the nape. The upper lip is yellow and the lower surface yellowish or greenish. In common with *Dannycoleus gen. nov.* there is a red colored tongue.

However the genus *Dannycoleus gen. nov.* is readily separated from other similar species of Charlepiersonserpenini by having a double loreal shield, which is unique within the tribe Charlepiersonserpenini.

In *Shaneblackus gen. nov.* the snout-vent may get up to about 740 mm and the tail up to 440 mm.

Distribution: *Shaneblackus gen. nov.* is known from Southern Asia, from India to southern China and south to include the Philippines and most of Indonesia, including both sides of Malaysia.

Etymology: Named in honour of Shane Black, a reptile keeper, formerly of Malabar in Sydney, New South Wales, Australia and more recently of Queensland in recognition of his excellent work keeping and breeding large numbers of the larger species of Australian elapid snakes, including Coastal Taipans (*Oxyuranus scutellatus*) and Inland Taipans (*Parademansia microlepidota*).

A search warrant was executed on an inexperienced snake handler, named Bryan Grieg Fry in Melbourne, Victoria, by government wildlife officers employed by the Department of Sustainability and Environment (DSE) as the department was then known. The officers had evidence of illegal activity relating to alleged wildlife trafficking and illegal keeping by Fry and his closest associates.

According to wildlife officers Fry sought to avoid charges by acting as an informant on others.

One of the people Fry provided "evidence" about was Shane Black (as well as several others).

Search warrants were executed simultaneously on these people, including Black at his NSW address.

The raid by officers of the NSW National Parks and Wildlife Service (NPWS) not only caused the break up and destruction of Black's top-class breeding facility in NSW, but also the end of his marriage and the premature death of his then former wife, this combined outcome being a direct result of the sequence of events precipitated by Fry.

Black fled the NSW NPWS harassment and moved to Queensland in order to conduct his herpetological activity which continues as of mid 2013.

Meanwhile the informant in the matter, Bryan Fry was tipped off about pending charges against him by DSE officers in Victoria and so he too went to Queensland in order to avoid being charged (Thuys 2013), with a statute of limitations on the matters being 24 months.

Content: *Shaneblackus pictus* (Gmelin, 1789) (type species); *S. andamanensis* (Anderson, 1871)

S. cyanochloris (Wall, 1921); *S. haasi* (Van Rooijen and Vogel, 2008); *S. inornatus* Boulenger, 1897; *S. ngansonensis* (Bourret, 1935); *S. nigroserratus* (Vogel, Van Rooijen and Hauser, 2012); *S. proarchos* (Wall, 1909), *S. striatus* (Cohn, 1905).

BRUCEGOWUS GEN. NOV.

Type species: *Dendrophis caudolineolatus* Günther, 1869.

Diagnosis: *Brucegowus gen. nov.* is separated from all other snakes in the genus *Dendrelaphis* and the tribe Charlepiersonserpenini as diagnosed herein (and/or by Hoser, 2012) by the following suite of characters: A cylindrical, narrow, slender body is present with a dorso-ventrally flattened pear shaped head. The neck region is clear. The snout is long and compressed and the tip of it is broad and rounded. The nostrils laterally oriented and rounded. A round pupil is present in large eyes. The prehensile tail is half the length as the snout-vent. Maxillary teeth 29-32, posterior largest; snout broadly rounded;

eye as long as its distance from the anterior border of the nostril; internasals shorter than the prefrontals; temporals 1+2; 8 supralabials, 4th and 5th touching the eye; vertebrals feebly enlarged, at mid-body narrower than the outer row of scales, the posterior margin rounded or truncate. Scales in 13:13:9 rows. 149 ventrals, divided anal and 119-128 divided subcaudals.

The colouration is as follows: Dorsally bronze-olive or bronze-orange with the forehead pale green. The anterior of the body has oblique black streaks with a narrow temporal stripe. On top of this stripe is a bronze-brown colour and the lower part is cream colour. Ventrally the body is grey or pale green. The last few ventral scales and the subcaudals have a black stripe running towards the tail and this is unique for the genus *Brucegowus gen. nov.* in terms of other snakes in the tribe Charlepiersonserpenini.

Distribution: Sri Lanka and India.

Etymology: Named in honour of Bruce Gow, licenced plumber of Park Orchards (outer Melbourne), Victoria, Australia, in recognition for important logistical work at the Snakebusters reptile facility. Gow has over more than a decade assisted on call to maintain the facility which includes crocodile cages and the like with all the usual plumbing paraphernalia. Without his services, we would have been unable to care for the animals properly and of course they are an essential part of the reptile education shows done by Snakebusters in Australia.

In other words, Gow has made an essential contribution to the education of Australians about wildlife and contributed to their conservation.

As with a lot of other tradespeople who build and maintain zoos and other facilities, Gow is one of an army of unsung heroes who assist in the wildlife conservation effort.

Content: *Brucegowus caudolineolatus* (Günther, 1869) (type species); *B. effrenis* (Wall, 1921).

SPECIES REMAINING WITHIN THE GENUS *DENDRELAPHIS* BOULENGER, 1890

Dendrelaphis caudolineatus (Gray, 1834) (type species); *D. ashoki* Vogel and Van Rooijen, 2011; *D. biloreatus* Wall, 1908; *D. caudolineatus* (Gray, 1834); *D. chairecaeos* (Boie, 1827); *D. formosus* (Boie, 1827); *D. grandoculis* (Boulenger, 1890); *D. grimeri* Vogel and Van Rooijen, 2008; *D. hollinrakei* Lazell, 2002; *D. humayuni* Tiwari and Biswas, 1973; *D. kopsteini* Vogel and Van Rooijen, 2007; *D. levitoni* Van Rooijen and Vogel, 2012; *D. marenae* Vogel and Van Rooijen, 2008; *D. oliveri* (Taylor, 1950); *D. schokari* (Kuhl, 1820); *D. subocularis* (Boulenger, 1888); *D. tristis* (Daudin, 1803); *D. underwoodi* Vogel and Van Rooijen, 2011; *D. walli* Vogel and Van Rooijen, 2011.

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CONFLICT OF INTEREST

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