

A Division of the Asian Reed Snakes, Genus *Calamaria* Boie, 1827 (Serpentes: Colubridae: Calamariinae).

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ABSTRACT

The largest (by species number) genus within the Colubrid subfamily Calamariinae is *Calamaria* Boie, 1827. In spite of the superficial similarity of the 70-odd recognized members within the genus, differences between species groups have long been recognized (Inger and Marx 1965).

This paper removes what may be the most divergent of these species *schmidti* Marx and Inger, 1955 and *leucogaster* Bleeker, 1860 from *Calamaria* and places them in a new genus *Crottyreedus* gen. nov..

The genus *Typhlocalamus* Günther, 1872 is recognized for the species from Borneo, *gracillima* as a subgenus and two new subgenera, *Freudreedus* subgen. nov. and *Oxyreedus* subgen. nov. are erected to accommodate divergent Asian taxa

Keywords: *Calamaria*; *Crottyreedus*; *Freudreedus*; *Oxyreedus*; *Typhlocalamus*; *schmidti*; *leucogaster*; *linnaei*; *concolor*; *septentrionalis*; Taxonomy; new genus.

INTRODUCTION

The so-called Reed Snakes of the genus *Calamaria* Boie 1827, haven't attracted the interests of a lot of herpetologists beyond the point of finding, naming and describing species, save for some definitive studies by Inger and Marx, most notably being their monograph of 1965.

Notwithstanding this study, two species within the group were identified by the same authors in 1955 as being divergent from the rest of the genus.

These taxa, including formally named by the same authors in 1955 as *Calamaria schmidti* differed from the others in the genus as then defined in its typical dentition.

They wrote:

"Two levels of maxillary tooth specialization are found in the species we have examined. The less modified condition occurs in *schmidti*, which has seven, widely spaced, unmodified ophidian teeth,

and in *leucogaster*, in which only the last two of its seven maxillary teeth are slightly enlarged at the base (fig. 22). The more specialized condition is characteristic of all the others. In these last, all of the

maxillary teeth are modified as illustrated. There is no space between successive teeth, and all are enlarged at the base."

The taxa *schmidti* and *leucogaster* are both from Borneo and are

divergent from all others within the genus as presently defined.

Molecular studies including that published by Pryon et. al. (2011) has shown that the genus *Calamaria* as defined has an ancient divergence from other groups and that the genus as currently defined would be paraphyletic.

While several potential splits within the genus are likely in the future, I herein take the most conservative position and only remove the two most divergent species, by placing them within a new genus *Crottyreedus* gen. nov. defined and named according to the Zoological Code (Ride et. al. 1999).

Inger and Marx (1965) provide an excellent bibliography and summary of the group *Calamaria* as then defined and so it is not necessary for me to rehash this monograph.

Some of the key publications relating to the relevant species include the following; Bleeker (1860), Boie (1827), Boulenger (1890, 1894, 1895), Duméril and Bibron (1854), David and Vogel (1996), Eydoux and Gervais (1837), Fischer (1835), Günther (1858, 1865), Haas (1950), Haas (1930), Inger and Marx (1965), Inger and Voris (2001), Jan and Sordelli (1865), Malkmus et. al. (2002), Manthey and Grossmann (1997), Marx and Inger (1955), Mertens (1930), Orlov (2009), Pope (1955), Rooij (1917), Savage and Myers (2005), Smith (1930, 1931, 1943), Taylor (1917, 1922), Tweedie (1950) and van Rooijen and van Rooijen (2007).

GENUS CROTTYREEDUS GEN. NOV.

Type species: *Calamaria schmidti* Marx and Inger, 1955

Diagnosis: The following characters define the external morphological divergence of *Calamaria* and *Crottyreedus* gen. nov. from the generalized, freely ranging colubrid stock: (1) no internasals; (2) prefrontals broadly in contact with supralabials; (3) reduction in size of nasal; (4) loreal absent (except in *C. tropica* Taylor); (5) reduction or loss of oculars; (6) reduction in size of eye; (7) reduction in number of labials; (8) parietals in contact with supralabials; (9) reduction in overall size; (10) reduction of tail. These characters add up to consolidation of head shields, proportional reduction of head and tail, and reduction of overall size; in short, the modifications commonly associated with burrowing snakes.

The genus *Crottyreedus* gen. nov. is most easily separated from all other *Calamaria* by dentition.

In the type species *schmidti*, there are seven, widely spaced, unmodified ophidian maxillary teeth, in the second species of the genus *leucogaster*, the last two of its seven maxillary teeth are slightly enlarged at the base. By contrast, the more specialized condition of the maxillary teeth (enlargement at the base) is characteristic of all species within *Calamaria*. There is no space between successive teeth, and all are enlarged at the base.

In terms of the species, *Schmidti*, the following diagnostic information is applicable.

It is a species with the eye much smaller than its distance from the mouth; 4 supralabials, the first three subequal; no preocular; frontal about five to six times as wide as supraocular; maxillary teeth conical; first pair of infralabials in contact behind mental.

The rostral broader than high, visible from above; prefrontals squarish, maximum length subequal to length of frontal, posterior border transverse, in contact with first and second labial and eye; nasal large, slightly larger than eye; eye small, diameter one-half its distance from the mouth; no preocular; one small

postocular, not as high as eye; supraocular small, about equal to nasal; frontal about as wide as long, pentagonal, 5 to 6 times width of supraocular, about two-thirds length of parietals; 4 supralabials, first three subequal, fourth twice length of second, second and third entering eye; 5 infralabials, first pair in contact behind mental, fourth largest; two pairs of chin shields, both pairs in contact, anterior in contact with three infralabials, anterior pair larger than posterior pair; parietals bordered posteriorly by three nuchals; vertebral row of nuchals distinctly smaller than para-vertebral rows.

Maxilla with 7 conical, slightly curved teeth widely spaced at the base.

Scales in 13 dorsal midbody rows; about 144 ventrals; 14 subcaudals; anal entire; tail ending in a blunt point; position of reduction to 4 dorsal scale rows, counting subcaudals forward from terminal scute 6.

Color is purplish gray above, uniform; head without markings; supralabials same color as back; anterior infralabials and first pair of chin shields purplish gray, remainder of underside of head yellowish; ventral surface without markings; anterior ventrals yellowish, belly becoming increasingly more purple posteriorly, but lighter than dorsal color; under side of tail darker than belly but slightly lighter than dorsal surface.

Distributed in Borneo, Indonesia/Malaysia.

In terms of the species, *leucogaster*, the following diagnostic information is applicable.

The following being based on female specimens only: 146-155 ventrals; 16-18 subcaudals; 5 supralabials, the third and fourth entering eye; 5 infralabials, first three pairs in contact with anterior chin shields; oculars 1+1; position of reduction to 4 dorsal scale rows, counting subcaudals forward from terminal scute 4-8; maxilla with 7 conical teeth.

Distributed in Borneo, Indonesia/Malaysia.

Distribution: This genus is known only from the island of Borneo, Indonesia/Malaysia.

Etymology: Named in recognition of a Great Dane cross Rottweiler dog, that I owned for nearly 13 years, named *Crotalus*, or "Crotty" for short, as well as the name of the kind of snake being identified, (common name: Reed Snake).

The loyal dog guarded my house and files for nearly 13 years from thefts by evil persons trying to stop truth being exposed in several books about wildlife crime, police and endemic judicial corruption in the Australian state of Victoria.

Without his loyal and uncomplaining work guarding the house while I spent long hours earning money to pay bills and debts, the various books, including "*Smuggled*" and "*Smuggled-2*" (Hoser 1993, 1996) would never have been published. Had those books not been published, it would still be illegal for most Australian citizens to be able to keep live reptiles in captivity.

I also note online criticisms by serial complainers and "trolls" of my naming taxa after animals, and reject them in total.

I happily concede to being an animal lover and one who detests animal cruelty in all its forms. If by naming a genus of snakes after an animal assists humans in appreciating animals, their vital role in maintaining our society and our need to care about their welfare, then I will be happy and satisfied.

PS *Crotalus* is a genus name for some well-known American Pitvipers.

Content of genus Crottyreedus gen. nov.

Crottyreedus schmidti (Marx and Inger, 1955) (Type species)

Crottyreedus leucogaster (Bleeker, 1860)

GENUS CALAMARIA BOIE, 1827.

Type species: *Calamaria linnaei* Boie, 1827

Diagnosis: The following characters define the external morphological divergence of *Calamaria* (and *Crottyreedus* gen. nov.) from the generalized, freely ranging colubrid stock: (1) no internasals; (2) prefrontals broadly in contact with supralabials; (3) reduction in size of nasal; (4) loreal absent (except in *C. tropica* Taylor); (5) reduction or loss of oculars; (6) reduction in size of eye; (7) reduction in number of labials; (8) parietals in contact with supralabials; (9) reduction in overall size; (10) reduction of tail. These characters add up to consolidation of head shields, proportional reduction of head and tail, and reduction of overall size; in short, the modifications commonly associated with burrowing snakes.

The genus *Crottyreedus* gen. nov. is most easily separated from all other *Calamaria* by dentition. In the type species *schmidti*, there are seven, widely spaced, unmodified ophidian maxillary teeth, in the second species of the genus *leucogaster*, the last two of its seven maxillary teeth are slightly enlarged at the base. By contrast, the more specialized condition of the maxillary teeth (enlargement at the base) is characteristic of all species within *Calamaria*. There is no space between successive teeth, and all are enlarged at the base.

Within *Calamaria*, three subgenera are herein recognized.

These are: *Typhlocalamus* Günther, 1872 and two new subgenera, *Freudreedus* subgen. nov. and *Oxyreedus* subgen. nov., all presently monotypic.

Distribution: *Calamaria* is distributed throughout the Sundas and nearby south-east Asia.

SUBGENUS TYPHLOCALAMUS GÜNTHER, 1872

Type species: *Typhlocalamus gracillima* Günther 1872

Diagnosis: Easily separated from all other *Calamaria* by the much longer thinner physique, reflected in the considerably higher ventral count. In this monotypic subgenus the ventral count is 300-320, while for all other *Calamaria* it is well under this number. There is no preocular, a tiny supraocular and the first lower labials are in contact.

Distribution: Known only from Sarawak, Borneo (Malaysia).

SUBGENUS FREUDREEDUS SUBGEN. NOV.

Type species: *Calamaria septentrionalis* Boulenger, 1890

Diagnosis: *Freudreodus* subgen. nov. is a monotypic subgenus which is separated from all other *Calamaria* by its tail which does not thin in the same manner as all other snakes in the genus, but rather it stays of similar thickness, ending in a rounded tip. In all other species within *Calamaria* the number of dorsal scale rows on the tail is usually reduced to four shortly before the terminal scute. The point at which the reduction to four scale rows occurs, as located by the number of subcaudals counted forward from the terminal scute, is relatively constant within species and a diagnostic feature.

The position of this reduction seems to depend more on the shape of the tail than on its length. While this point is somewhere between the second and fifteenth subcaudal on the tail for all other species in *Calamaria* (usually 8-9), this is not the case for the single species within this subgenus.

The species *septentrionalis* also has a shorter tail than for all other species and with subcaudal counts lower than for all other *Calamaria*, being 18 in males and 10-11 in females. The only other *Calamaria* with subcaudal counts approaching (and occasionally equalling) these are *pendleburyi* and *lautensis*, both of whom are easily distinguished by their noticeably thinning tail (as opposed to one that does not), reflected by the reduction of dorsal scale rows to four at subcaudals 8-9.

Other diagnostic features of this subgenus are, ventrals around 160 (males), subcaudals 18 (males),

ventrals 179-180 (females), subcaudals 10-11 (females), supralabials 4, second and third entering eye; infralabials 5, first pair in contact behind mental, first three pairs in contact with anterior chin shields; oculars 1+1; dorsal scale rows reduce from 6 to 1 abruptly at end of tail (see above); maxilla with 8 modified teeth.

Distribution: Known only from south-east China and adjacent North Vietnam.

Etymology: Named in recognition of a Dachshund cross Doberman dog that I had for about nine years until I was aged 16, whom I grew up with and had trained to sniff out and find snakes and lizards, enabling me to find quantities of reptiles other collectors could only dream of.

The dog was named by my parents Sigmund Freud (they called him "Freud" for short) in recognition of the famous psychologist, due to the fact that the dog looked intelligent and actually was!

For some years before his death from a bite from a Red-bellied Black Snake near Oxford Falls, NSW, Australia, I would hitch-hike to all parts of Australia with the dog and catch reptiles.

In fact the day he was bitten, myself and friend had hitch-hiked to Oxford Falls to go in search of reptiles and had to hitch-hike home with the dead body.

I also note online criticisms by serial complainers and "trolls" of my naming taxa after animals, and reject them in total.

I happily concede to being an animal lover and one who detests animal cruelty in all its forms. If by naming a subgenus of snakes after an animal assists humans in appreciating animals, their vital role in maintaining our society and our need to care about their welfare, then I will be happy and satisfied.

SUBGENUS OXYREEDUS SUBGEN. NOV.

Type species: *Calamaria concolor* Orlov et. al., 2010

Diagnosis: This monotypic subgenus differs from all known species of the genus *Calamaria* by combination of pholidosis characters and by uniform coloration of the body. The species has the following characters: tail tip thick, obtusely rounded, and slightly flattened laterally; maxillary teeth eight, modified; loreals absent; preocular present; supralabials 5/5, second and third entering orbit; infralabials 5/5; paraparietal surrounded by five shields; midbody scales in 13 rows, reducing to 11 rows at the level of single anal plate; ventrals 3 + 209; subcaudals 19, divided; body uniform light brown above and without color pattern; belly cream.

Oxyreedus subgen. nov. can be distinguished from all the Indochinese species by its relatively wide and flat head and monochrome coloration.

In terms of Indochinese forms it is separated by the following characteristics: *Oxyreedus* subgen. nov. differs from *C. buchi* by having fewer ventrals (3 + 209 vs. 221 - 236) and more supralabials (5 vs. 4) (Inger and Marx 1965); from *C. lovii gimleti* by the presence of a preocular (which is absent in the latter subspecies), fewer number of ventrals (3 + 209 vs. 215 - 249) and more subcaudals (19 vs. 10 - 12), as well as $F > PF$ (contrary condition in *C. lovii gimleti*) (Inger and Marx, 1965); from *C. lovii ingermarxorum* by the presence of a preocular and more supralabials (5 vs. 4) (Darevsky and Orlov 1992); from *C. pavimentata* by having more supralabials (5 vs. 4) and lacking body color pattern (dorsum uniform brown vs. dorsum with narrow, dark, longitudinal stripes, and with solid black color immediately behind the neck in *C. pavimentata*) (Inger and Marx 1965, Ziegler and Le 2005); from *C. septentrionalis* by having more supralabials (5 vs. 4) and mental in contact with anterior chin shields (vs. mental separated from anterior chin shields) (Inger and Marx, 1965); from *C. thanhi* by the presence of a preocular and the absence of color pattern (vs. preocular absent and dorsum dark, with 4 - 6 light body bands in *C. thanhi*) (Ziegler and Le 2005); from *C. sangi* by having more ventrals and supralabials (V 3 + 209, Supralab 5 vs. V 2 + 190, Supralab 4) (Nguyen et. al. 2010b); from *C. Gialaiensis* by having more ventrals and supralabials (V 3 + 209, Supralabials 5 vs. V 3 + 191, Supralabials 4), and color pattern on body (uniform brown above vs. dorsum light grayish brown with few dark blotches along posterior vertebral region) (Ziegler et al. 2009).

Oxyreedus subgen. nov. differs from *C. Yunnanensis* by the presence of a preocular; from *C. lumbricoidea* in having more ventrals (3 + 209 vs. 144 - 196 in males) (Inger and Marx 1965), greater body length (SVL 536 mm vs. 144 - 196 in males) (Inger and Marx 1965), and different type of coloration; from *C. Albiventer* by having larger body size (SVL 536 mm vs. 205 in males), more ventrals (3 + 209 vs. 3 + 143 - 144), and second and third supralabials entering orbit (third and fourth entering orbit in *C. albiventer*) (Inger and Marx 1965); from *C. schlegeli schlegeli* by having greater body length (SVL 536 mm vs. 125 - 391 in males), more ventrals (3 + 209 vs. 3 - 4 + 129 - 161 in males), and supralabials entering orbit (second and third scales vs. third and fourth), mental in contact with anterior chin shields (contrary condition in *C. schlegeli schlegeli*) (Inger and Marx 1965); from *C. prakkei* by having larger body length (SVL 536 mm vs. 172 - 245 mm), second and third supralabials entering orbit (vs. Third and fourth entering orbit), more ventrals (3 + 209 vs. 3 + 126 - 132 in males), and the difference of coloration (body uniform brown without pattern above vs. Scattered mid-dorsal scales with a dark central spots, scales of first row yellow in centers forming longitudinal stripes) (Inger and Marx, 1965); from *C. ingeri* by having second and third supralabials entering orbit (third and fourth entering orbit in latter species), mental in contact with anterior chin shields (separated in *C. ingeri*), and the difference of color pattern on back (uniform brown without pattern above vs. 26 incomplete light transverse bands on body and tail) (Grismer et al. 2004).

The previous diagnosis was taken, with minor alterations directly as quoted from Orlov et. al. (2010).

Distribution: Known only from a single specimen collected in the tropical rain forest, Thua Thien - Hue Province, Vietnam (Orlov et. al. 2010).

Etymology: Named in honour of my Great Dane dog Oxyuranus (called "Oxy" for short) who for eight years protected the Snakebusters reptiles safe from numerous attempted thefts by DSE (wildlife) officers acting outside their legal jurisdiction and inexperienced rival demonstrators seeking to undermine our position as the best reptile shows in Australia.

I also note online criticisms by serial complainers and "trolls" of my naming taxa after animals, in particular the ever complaining Mark O'Shea and reject them in total.

I happily concede to being an animal lover and one who detests animal cruelty in all its forms. If by naming a subgenus of snakes after an animal assists humans in appreciating animals, their vital role in maintaining our society and our need to care about their welfare, then I will be happy and satisfied.

PS *Oxyuranus* is a scientific name for a well-known Australian elapid snake.

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