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A sensible breakup of the South-east Asian Pitviper genus *Calloselasma* Cope, 1860 *sensu lato* and the description of a new species.

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ABSTRACT

The taxonomy and nomenclature of the south-east Asian Pitviper genus *Calloselasma* Cope, 1860 has been stable for many years.

Most authors have treated it as being monotypic for the species originally described as *Trigonocephalus rhodostoma* Kuhl, 1824. Cope erected the genus *Calloselasma* to accommodate the species in 1860.

In 1933 Angel described the species *Ancistrodon annamensis*, which was synonymised with *Calloselasma rhodostoma* (Kuhl, 1824) by most later authors.

A review of snakes assigned to the species *Calloselasma rhodostoma* (Kuhl, 1824) found three distinctive regional populations worthy of taxonomic recognition at the species level based on both published molecular data from various studies as well as obvious morphological differences between populations.

Available names are assigned to two.

These are *Calloselasma rhodostoma* (Kuhl, 1824) for the nominate form from Java, Malaysia and potentially Rayong Province, Thailand. The available name C. *annamensis* (Angel, 1933) is applied to the population from north East Thailand and nearby Vietnam.

The third is formally named for the first time as *C. oxyi sp. nov.* and it is known from Kanchanaburi and Prachaup Khiri-Khan, Thailand and presumably occurs in immediately proximate parts of Myanmar (Burma).

Keywords: Taxonomy; Nomenclature; Viper; pitviper; South-east Asia; Asia; Thailand; Java; Cambodia; Myanmar; Burma; Malaysia; Vietnam; Laos; Indonesia; *Calloselasma*; *rhodostoma*; *annamensis*; new species; *oxyi*.

INTRODUCTION

The Malayan Pitviper *Calloselasma rhodostoma* (Kuhl, 1824) has had a stable taxonomy and nomenclature for decades.

The putative species occurs in the region of Peninsula Malaysia and nearby areas of south-east Asia.

Most authors have treated it as being monotypic for the species originally described as *Trigonocephalus rhodostoma* Kuhl, 1824. Cope from the United States of America erected the genus *Calloselasma* to accommodate the species in 1860 and this treatment of the species has been generally continued ever since.

In 1933 Angel described the species *Ancistrodon annamensis*, which has been synonymised with *Calloselasma rhodostoma* (Kuhl, 1824) by most later authors that have noted the two available names. A review of snakes assigned to the species *Calloselasma rhodostoma* (Kuhl, 1824) by inspection of live specimens, corpses in Museums and numerous published images, found three distinctive regional populations worthy of taxonomic recognition at the species level.
The evidence for this also came from published molecular data from various studies as well as obvious morphological differences between populations.

Available names are assigned to two of these populations.

These are *Calloselasma rhodostoma* (Kuhl, 1824) for the nominate form from Java, Malaysia and potentially Rayong Province, in southern Thailand. The available name C. *annamensis* (Angel, 1933) is applied to the population from north East Thailand and nearby Vietnam.

The third is formally named for the first time as *C. oxyi sp. nov.* according the the rules laid out in the *International Code of Zoological Nomenclature* (Ride *et al.* 1999) and it is known from Kanchanaburi and Prachaup Khiri-Khan, Thailand and presumably occurs in the immediately proximate parts of Myanmar (Burma).

MATERIALS AND METHODS

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

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

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

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

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

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

from earlier studies.

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

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

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

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

When appropriate other factors such as sea currents may be examined to indicate likely gene flow by rafting over distance and time.

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

This means that if a name has been properly proposed in the past (even if in the absence of sound scientific data at the time), it is used as is done in this paper. Alternatively, if no name is available, one is proposed according to the rules of *International Code of Zoological Nomenclature*, often called "The Code" as is also done in this paper.

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

The published literature relevant to *Calloselasma* Cope, 1860 *sensu lato* and the taxonomic and nomenclatural judgements made within this paper includes the following:

Angel (1933), Boie (1827), Boulenger (1896), Bulian (2003), Chanard *et al*. (1999, 2015), Cox *et al.* (1998), Daltry *et al.* (1996), Das (2012), de Rooij (1917), Duméril *et al.* (1854), Geissler *et al.* (2011a, 2011b), Grismer *et al.* (2008a, 2008b), Gumprecht *et al.* (2004), Koch (1991), Kopstein (1938), Kuhl (1824), Manthey and Grossmann (1997), McDiarmid *et al*. (2009), Onn *et al.* (2009), Parkinson (1999), Pauwels *et al.* (2000, 2003), Pyron *et al.* (2011, 2013a, 2013b), Ride *et al*. (1999), Sacha (2015), Saint Girons (1972), Sang *et al.* (2009), Seung Hoon (2012), Smith (1939), Strine *et al.* (2015), Stuart and Emmett (2006), Stuart *et al.* (2006), Sworder (1933), Taylor (1965), Visser (2015), Vonk and Richardson (2008), Wallach *et al.* (2014) and sources cited therein.

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

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

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

These areas still remain heavily impacted by non-residential human activities.

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

NOTE ON THE DESCRIPTION HEREIN FOR ANY REVISORS

Unless mandated by the rules of the currently in force edition of the *International Code of Zoological Nomenclature*, the spelling of the newly proposed name should be altered in any way.

CALLOSELASMA OXYI SP. NOV.

Holotype: A preserved specimen at the US National Museum, now called the National Museum of Natural History; Smithsonian Institution; Washington, DC, USA, specimen number: USNM Amphibians and Reptiles, specimen number: 94939, collected from Prachuap Khiri Khan, Sam Roi Yot, Thailand in 1932. Lat. 12.2458 N, Long. 99.96 E.
The National Museum of Natural History; Smithsonian Institution; Washington, DC, USA, allows access to its holdings.

Diagnosis: *Calloselasma oxyi sp. nov.* has until now been regarded as a regional population of *Calloselasma rhodostoma* (Kuhl, 1824) as has a third species, herein given the available name *Calloselasma annamensis* (Angel, 1933).

All three vipers are separated from all other pitvipers and defined by the following suite of characters: Snout pointed and somewhat turned up at the end. The rostral is as deep as broad, or a little deeper than broad; they have a pair of internasals and a pair of prefrontals; the frontal is as long as or a little longer than its distance from the end of the snout and as long as or a little shorter than the parietals; upper preocular separated from the posterior nasal by a loreal; one or two postoculars and one subocular, separating the eye from the labials; loreal pit separated from the labials; 7 to 9 upper labials. Scales are smooth, in 21 dorsal mid-body rows. There are 138-157 ventrals; 34-54 single and/or divided subcaudals.

Dorsally the general colour may be reddish, greyish, or pale brown above, with large angular, dark brown, black-edged spots disposed in opposite pairs or alternating; a dark brown vertebral line; lips yellowish or pink, powdered with brown; a broad dark brown, yellowish venter that is uniform or powdered or spotted with greyish brown (adapted from Boulenger 1896, pages 526-527).

The species *C. rhodostoma* is separated from the other two species by the possession of a well-defined black-edged band, festooned below, from the eye to the angle of the mouth, with a light band above it.

In essence in this species it gives the appearance of a human bite mark on the lower edge, which is distinctive for this species.
In the species *Calloselasma oxyi sp. nov.* the darker region from the eye to the angle of the mouth is not blackish in colour as seen in *C. rhodostoma* and it is also very heavily peppered. In the species *C. annamensis* the darker region from the eye to the angle of the mouth is also not blackish in colour as seen in *C. rhodostoma* and is also of relatively even thickness as it progresses from front to back, versus obviously variable thickness from front to back in the other two species.

Calloselasma oxyi sp. nov. is the only species of the trio in which the darker region from the eye to the angle of the mouth does not have a well defined lower margin.

Calloselasma oxyi sp. nov. is further separated from both *C. rhodostoma* and *C. annamensis* by a noticeable degree of peppering or specks of darker pigment on the lower labials and nearby chin shields.

Distribution: *C. rhodostoma* is found on Java and nearby parts of Peninsula Malaysia, to far southern Thailand. *C. annamensis* is found in Vietnam, Cambodia and immediately adjacent parts of Thailand, east of Bangkok. *Calloselasma oxyi sp. nov.* is restricted to Western Thailand and presumably adjacent parts of Burma.

Etymology: Named in honour of the now deceased Great Dane pet at the Hoser family household, named "Oxy" (short for "*Oxyuranus*" an elapid snake genus) in recognition of his work over 8 years in protecting the Hoser research facility to keep it free of thefts by thieves and others who would seek to steal what is not theirs. I have no hesitation in naming a species in honour of a non-human inhabitant of this planet.

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CONFLICT OF INTEREST

The author has no known conflicts of interest.