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Not a monotypic genus!
Aplopeltura boa (Boie, 1828) divided!

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ABSTRACT

Until now the Blunt-headed Slug Eating Snake from South-east Asia (Family: Pareidae), has been treated as being of a single species, namely *Aplopeltura boa* (Boie, 1828). However inspection of specimens from across the known range, shows that they are sufficiently divergent from one another in geographically separated populations to warrant being named as separate species. Available distributional and molecular evidence supports this contention.

Hence the previously monotypic genus *Aplopeltura* Duméril, 1853 is herein divided into six well-defined species, five formally named for the first time according to the *International Code of Zoological Nomenclature* (Ride *et al*. 1999).

Another species within the Pareidae, namely *Pareas carinatus* (Boie, 1828) is known to have divergent populations, which have been variously described as species and subspecies.
Recognizing the three previously named forms (including the nominate one) herein as subspecies, two more obviously unnamed geographically separated subspecies are also formally named for the first time.

Keywords: Taxonomy; Snakes; South-east Asia; Asia; *Aplopeltura*; *boa*; new species; *shireenae*; *omarelhelou*; *lynnejohnstoneae*; *daranini*; *gibbonsi*; new subspecies; *sumatrensis*; *malayensis*.

INTRODUCTION

Until now the Blunt-headed Slug Eating Snake from south-east Asia (Family: Pareidae), has been treated as being of a single widespread species, namely *Aplopeltura boa* (Boie, 1828). However inspection of specimens by myself over some years from across the known range, shows that they are sufficiently divergent from one another in geographically separated populations to warrant being named as separate species.

Significant data was obtained from across the range of the putative species, but this was stolen in an illegal armed raid on my facility on 17 August 2011 by corrupt wildlife officers seeking to permenantly disable my successful wildlife education business, "Snakebusters, Australia's best reptiles shows" (Court of Appeal Victoria 2014, VCAT 2015).

None of this material was returned.

Shortly after this illegal armed raid, Hoser (2012a) did the obvious step of dividing the related genus *Pareas* Wagler, 1830 as then known, along obvious morphological and phylogenetic lines. Hoser (2012a) also erected a subgenus for another divergent lineage.

As the extensive data gathered relevant to the species-level taxonomy was not returned, this material was not published in 2012.

However with ongoing environmental distruction in the South-east Asian realm coupled with the fact that this is likely to get worse rather than better in the foreseeable future, it is important that regional populations warranting taxonomic recognition get this sooner, rather than later, so as not to jeopardize their very existence.

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

Noting that publicly available distributional and molecular evidence supports the contention that there is more than one species under the label *Aplopeltura boa*, I have now made the decision to formally name the most obviously divergent groups in accordance with the *International Code of Zoological Nomenclature* (Ride *et al*. 1999).

Hence the previously monotypic genus *Aplopeltura* Duméril, 1853 is herein divided into six well-defined species, five formally named for the first time.

I also note that relevant texts (e.g. Das 2012) speak of putative *Aplopeltura boa* as being widely distributed throughout the South-east Asian realm. However a survey of museum holdings records suggests that the distribution is somewhat disjunct and largely confined to hilly areas and those immediately proximate to them. See for example the distribution data in David and Vogel (1996).

Hence the concept that currently divided populations were most likely similarly divided during recent glacial maxima is the one I am subscribing to and in the absence of evidence to the contrary.

While putative *Aplopeltura boa* vary significantly in both

colouration and scalation within a single locality, there are differences that are consistent between locations and these are used as the basis to diagnose each species.

Another species within the family Pareidae, namely *Pareas carinatus* (Boie, 1828) is known to have divergent populations, which have been variously described as species and subspecies.

The best known of these is *P. nuchalis* (Boulenger, 1900), treated by authors in the past as either a full species, or a synonym of *P. carinatus*.
While Hoser (2012a) treated *P. nuchalis* as a full species, in accordance with the views of de Rooij (1917), Malkmus (1996), Malkmus *et al.* (2002) and evidence of Guo *et al.* (2011), this was contradicted by the results of Pyron *et al.* (2013), that implied *P. nuchalis* was conspecific with *P. carinatus*.
In light of this new evidence of Pyron *et al.* (2013) and that of Guo *et al.* (2011), I herein conservatively treat both *P. nuchalis* and the previously described subspecies of *P. carinatus* described as *Amblycephalus carinatus unicolor* Bourret, 1934 as subspecies of *P. carinatus.*
Recognizing the three previously named forms, including the nominate one herein as subspecies, two more obviously unnamed geographically separated subspecies are also formally named for the first time.

As for *A. boa* above, I also note that relevant texts (e.g. Das 2012) speak of putative *P. carinatus* as being widely distributed throughout the South-east Asian realm. However a survey of museum records suggests that the distribution is somewhat disjunct (but wider than for *A. boa*) and largely confined to hilly areas and those immediately proximate to them. See for example the distribution data in David and Vogel (1996).

I also note that the basis or material and methods underpinning the taxonomy herein has been an inspection of live and dead specimens, photos with good locality data and the relevant available literature that summarizes relevant facts about the relevant taxa.
Museum records were audited to ascertain the extent of known populations, via collection records and localities.

The results are of course the formal taxonomic proposals within this paper as outlined both above and in the descriptions below.

Important references relevant to *Aplopeltura* and the taxonomic decisions within this paper include the following: Boie (1828), Boulenger (1894, 1896), Chan-ard *et al.* (2015), Cox *et al.* (1998), Das (2012), David and Vogel (1996), de Rooij (1917), Dowling and Jenner (1998), Duméril (1853), Grandison (1978), Grismer *et al.* (2010), Grossmann and Tillack (2001), Hofmann (2015), Hoser (2012a), Kopstein (1938), Manthey and Grossmann (1997), Pyron *et al.* (2013), Schlegel (1837), Smith (1943), Taylor (1965), Teynié *et al.* (2010), Tweedie (1950) and sources cited therein.

Important references relevant to *Pareas carinatus* (Boie, 1828), as recognized to date including the taxon, *P. nuchalis* (Boulenger, 1900), either as a full species, subspecies of *P. carinatus* or treated as synonymous to it, include: Boie (1828), Boulenger (1900), Chan-ard and Nabhitabhata (2015), Chan-ard *et al.* (1999), Cox *et al.* (1998), Danaisawadi *et al.* (2016), Das (2012), de Rooij (1917), David and Vogel (1996), Dowling and Jenner (1998), Geissler *et al.* (2011), Götz (2001, 2002), Grismer *et al.* (2008), Guo and Deng (2009), Hoser (2012a), Kopstein (1936, 1938), Lang (2012), Malkmus and Sauer (1996), Malkmus *et al.* (2002), Manthey and Grossmann (1997), Mertens (1930), Pauwels *et al.* (2003), Pyron *et al.* (2013), Sang *et al.* (2009), Savage (2015), Schlegel (1837), Schmidt and Kunz (2005), Sclater (1891), Smedley (1931), Smith (1943), Stuart and Emmett (2006), Taylor (1965), Teynié *et al.* (2010), Wagler (1830), Zhao and Adler (1993), Ziegler *et al.* (2006, 2007) and sources cited therein.

NOTES ON THE DESCRIPTIONS FOR ANY POTENTIAL REVISERS

Unless mandated by the rules of the *International Code of Zoological Nomenclature*, none of the spellings of the newly proposed names should be altered in any way. Should one or more newly named taxa be merged by later authors to be treated as a single species, the order of prority of retention of names should be the order as listed in the keywords part of the abstract.

APLOPELTURA SHIREENAE SP. NOV.

Holotype: A preserved specimen held at the Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, USA, specimen number: CM Herps R2427, collected from Agusan Province, Mindanao, Philippines, Asia. The Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, USA, allows access to its holdings.

Paratypes: Two preserved specimens held at the Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, USA, specimen numbers: CM Herps R2428 and CM Herps R2429, collected from Agusan Province, Mindanao, Philippines, Asia.

Diagnosis: *Aplopeltura shireenae sp. nov.* from the main Philippine Islands, including Mindanao, are readily separated from all other *Aplopeltura* species by the following suite of characters: A generally very indistinct dorsal pattern, being a light reddish-brown in colour, the lateral white blotches rising from the belly on the lower flanks are so heavily shaded that they are barely noticeable and this includes for the anterior section of the body, which is only similarly seen in *Aplopeltura lynnejohnstoneae sp. nov.* from the lower Malay Peninsula. *A. shireenae sp. nov.* is separated from *A. lynnejohnstoneae sp. nov.* by several characters including a lack of melanism on the dorsal surface of the head (see in *A. lynnejohnstoneae sp. nov.*) and a lack of the profuse blackish specking seen on the dorsal surface of *A. lynnejohnstoneae sp. nov.*.

The top of the head of *A. shireenae sp. nov.*, while also reddish brown in colour has two distinct white patches somewhat anterior to the eyes, pointing towards the middle of the head, but not meeting. The iris is brownish in colour and characterised by the presence of whitish specks.

Aplopeltura boa (Boie, 1828) from Java is readily separated from others in the genus (as defined herein) by significant somewhat irregular shaped white patches along the dorsal midline. The dark patch below the eye that commences on the jawline, does not extend as far as the eye or if so, only just intersects it.

Aplopeltura omarelhelou sp. nov. from southern Thailand on the Isthumus of Kra in the region generally north of and including Songkhla and Trang are readily separated from those on the lower Malay Peninsula (*A. lynnejohnstoneae sp. nov.*) and all other species of *Aplopeltura* by the well defined whitish etchings on the rear margins of otherwise darker labials.
A. omarelhelou sp. nov. are also separated from the other species by the obvious dark purplish red markings on the head and dorsal surface.

White markings in the form of irregular shaped, but vaguely triangular blotches are very distinct and well defined in *A. omarelhelou sp. nov.*, as opposed to being either moderately well-defined or poorly defined in all other species.
Aplopeltura lynnejohnstoneae sp. nov. from the lower Malay Peninsula are readily separated from all other species of *Aplopeltura* by having significant melanism on the upper surface of the head, very white upper labials, the white lacking any darker pigment, sheen or flecks as seen in all other species, this being except for a small triangular dark patch under the eye (such a dark patch in one form or other is seen in all species), but which is far narrower than the eye itself in this species, and an indistinct dorsal pattern also defined by the presence of numerous irregular black or blackish flecks throughout.

Aplopeltura daranini sp. nov. from Sumatra is readily separated from all other species of *Aplopeltura* by being similar in most

respects to *A. lynnejohnstoneae sp. nov.* as defined above, but by the following obvious differences. It has an orange sheen or peppering over the white upper labials so that they do not appear to be an immaculate white in colour, as well as the markings of the iris. In *A. lynnejohnstoneae sp. nov.* the iris is more-or-less of one colour being a brownish colour, wheras in *A. daranini sp. nov.* the iris is generally whitish in colour, but with darker reddish veins or markings running more-or-less radially out from the centre. On *A. daranini sp. nov.* the indistinct dorsal pattern is defined by the presence of irregular black spots as opposed to smaller blackish flecks as seen in *A. lynnejohnstoneae sp. nov.*.

Aplopeltura gibbonsi sp. nov. from Borneo is separated from all other *Aplopeltura* by the following characters: Having a reasonably distinct dorsal pattern consisting of irregular markings or blotches on the dorsal surface, the most obvious ones being an orangeish red in colour. The white markings on the lower flanks and white parts of the upper labials are heavily peppered making them appear to be off-white and a shade of the peppering, or alternatively fully shaded as another colour anyway (e.g. yellow). The dark patch under the eye is also well-broken by one or more streaks of white pigment, this also being well peppered or shaded by a colour such as yellow, orange or red.

Members of the family Pareidae (alternatively referred to as the Pareatidae) are unique among Southeast Asian snakes and diagnosed in having large scales overlapping on their chins rather than having them separated by a straight groove. These snakes are known to feed mainly on terrestrial molluscs.

They have short skulls; relatively large eyes; a large nasal gland; have a relatively low number of scales at mid body (13-15 rows); the chin shields have no midline groove, and extend across the chin; they are nocturnal; they feed mostly upon gastropods and small vertebrates; and they lay eggs.

The maxillary bone is very short, deep and with 5 or 6 subequal mandibular teeth gradually decreasing in length. The head is distinct from the neck; eye moderate, with a vertical pupil; nasal single. Body more or less compressed; scales smooth or feebly keeled, without pits, more or less oblique, in 13-15 rows, vertebral row may be enlarged or not (depending on the genus). Ventrals rounded. Tail moderate or short; subcaudals divided.

Observations on captive and wild snakes eating snails suggests that they rest the upper jaw on a snail (preferred food) and use the mandibles to pull the snail's body out of its shell. These are thought to represent a basal lineage of the advanced snakes (Caenophidia).

There are 4 recognized genera and about 15 species currently recognized (before the publication of this paper), all inhabiting Southeast Asia.

Genus *Aplopeltura* Duméril, 1838 has until now been treated as being monotypic for the species *A. boa* (Boie, 1828), but split six ways in this paper, with five new species formally named.

Snakes in the genera *Aplopeltura* Duméril, 1838 and *Asthenodipsas* Peters, 1864 are considerably thinner in build and show significant vertical compression (also seen as a distinct midline ridge along the back), that is not seen in *Pareas* Wagler, 1830 or *Katrinahoserserpenea* Hoser, 2012 as recognized to date.

Aplopeltura has 26-55 single subcaudals, versus 88-120 divided subcaudals in *Asthenodipsas* as well as numerous other differences at outlined by Boulenger (1896) in his species-level descriptions.

Distribution: Philippine Islands.

Etymology: Named in honour of my wife, Shireen Hoser in recognition of many years services to herpetology and zoological taxonomy, including successfully assisting in petitioning the ICZN to stop taxonomic vandalism in the 1990's, in a case where Robert George Sprackland of the USA attempted to unlawfully steal "name authority" for a species of monitor lizard formally named by Richard Wells and Cliff Ross Wellington, some years earlier (Hoser 2007).

APLOPELTURA OMARELHELOU SP. NOV.

Holotype: A preserved specimen at the KU Biodiversity Institute and Natural History Museum, University of Kansas, Lawrence. USA, specimen number: KU KUH 328493, collected at Mountain View Bungalos, near the entrance to the Khao Sok National Park, Thailand, Latitude 8.91, Longitude 98.53.

This is a facility that allows access to its holdings.

Diagnosis: *Aplopeltura omarelhelou sp. nov.* from southern Thailand on the Isthumus of Kra in the region generally north of and including Songkhla and Trang are readily separated from those on the lower Malay Peninsula (*A. lynnejohnstoneae sp. nov.*) and all other species of *Aplopeltura* by the well defined whitish etchings on the rear margins of otherwise darker labials. *A. omarelhelou sp. nov.* are also separated from the other species by the obvious dark purplish red markings on the head and dorsal surface.

White markings in the form of irregular shaped, but vaguely triangular blotches are very distinct and well defined in *A. omarelhelou sp. nov.*, as opposed to being either moderately well-defined or poorly defined in all other species.
Aplopeltura lynnejohnstoneae sp. nov. from the lower Malay Peninsula are readily separated from all other species of *Aplopeltura* by having significant melanism on the upper surface of the head, very white upper labials, the white lacking any darker pigment, sheen or flecks as seen in all other species, this being except for a small triangular dark patch under the eye (such a dark patch in one form or other is seen in all species), but which is far narrower than the eye itself in this species, and an indistinct dorsal pattern also defined by the presence of numerous irregular black or blackish flecks throughout.

Aplopeltura shireenae sp. nov. from the main Philippine Islands, including Mindanao, are readily separated from all other *Aplopeltura* species by the following suite of characters: A generally very indistinct dorsal pattern, being a light reddish-brown in colour, the lateral white blotches rising from the belly on the lower flanks are so heavily shaded that they are barely noticeable and this includes for the anterior section of the body, which is only similarly seen in *Aplopeltura lynnejohnstoneae sp. nov.* from the lower Malay Peninsula. *A. shireenae sp. nov.* is separated from *A. lynnejohnstoneae sp. nov.* by several characters including a lack of melanism on the dorsal surface of the head (see in *A. lynnejohnstoneae sp. nov.*) and a lack of the profuse blackish specking seen on the dorsal surface of *A. lynnejohnstoneae sp. nov.*.

The top of the head of *A. shireenae sp. nov.*, while also reddish brown in colour has two distinct white patches somewhat anterior to the eyes, pointing towards the middle of the head, but not meeting. The iris is brownish in colour and characterised by the presence of whitish specks.

Aplopeltura boa (Boie, 1828) from Java is readily separated from others in the genus (as defined herein) by significant somewhat irregular shaped white patches along the dorsal midline. The dark patch below the eye that commences on the jawline, does not extend as far as the eye or if so, only just intersects it.

Aplopeltura daranini sp. nov. from Sumatra is readily separated from all other species of *Aplopeltura* by being similar in most respects to *A. lynnejohnstoneae sp. nov.* as defined above, but by the following obvious differences. It has an orange sheen or peppering over the white upper labials so that they do not appear to be an immaculate white in colour, as well as the markings of the iris. In *A. lynnejohnstoneae sp. nov.* the iris is more-or-less of one colour being a brownish colour, wheras in *A. daranini sp. nov.* the iris is generally whitish in colour, but with darker reddish veins or markings running more-or-less radially out from the centre. On *A. daranini sp. nov.* the indistinct dorsal pattern is defined by the presence of irregular black spots as

opposed to smaller blackish flecks as seen in *A. lynnejohnstoneae sp. nov.*.

Aplopeltura gibbonsi sp. nov. from Borneo is separated from all other *Aplopeltura* by the following characters: Having a reasonably distinct dorsal pattern consisting of irregular markings or blotches on the dorsal surface, the most obvious ones being an orangeish red in colour. The white markings on the lower flanks and white parts of the upper labials are heavily peppered making them appear to be off-white and a shade of the peppering, or alternatively fully shaded as another colour anyway (e.g. yellow). The dark patch under the eye is also well-broken by one or more streaks of white pigment, this also being well peppered or shaded by a colour such as yellow, orange or red.

Members of the family Pareidae (alternatively referred to as the Pareatidae) are unique among Southeast Asian snakes and diagnosed in having large scales overlapping on their chins rather than having them separated by a straight groove. These snakes are known to feed mainly on terrestrial molluscs.

They have short skulls; relatively large eyes; a large nasal gland; have a relatively low number of scales at mid body (13-15 rows); the chin shields have no midline groove, and extend across the chin; they are nocturnal; they feed mostly upon gastropods and small vertebrates; and they lay eggs.

The maxillary bone is very short, deep and with 5 or 6 subequal mandibular teeth gradually decreasing in length. Head is distinct from the neck; eye moderate, with a vertical pupil; nasal single. Body more or less compressed; scales smooth or feebly keeled, without pits, more or less oblique, in 13-15 rows, vertebral row may be enlarged or not (depending on the genus). Ventrals rounded. Tail moderate or short; subcaudals divided.

Observations on captive and wild snakes eating snails suggests that they rest the upper jaw on a snail (preferred food) and use the mandibles to pull the snail's body out of its shell. These are thought to represent a basal lineage of the advanced snakes (Caenophidia).

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Aplopeltura has 26-55 single subcaudals, versus 88-120 divided subcaudals in *Asthenodipsas* as well as numerous other differences at outlined by Boulenger (1896) in his species-level descriptions.

Distribution: Southern Thailand on the Isthumus of Kra in the region generally north of and including Songkhla and Trang.

Etymology: Named in honour of Omar Elhelou of Melbourne, Victoria, Australia, owner of Precision Security Australia who has made a significant contribution to wildlife conservation and research in Australia by by installing security systems to safeguard the animals and property of Snakebusters: Australia's best reptile shows.

The patronym name would in the normal course of events be designated as "*omarelhelou*" instead of the designated name "*omarelhelou*" but the spelling I have given it in this paper is deliberate and should not be amended unless mandated by the *International Code of Zoological Nomenclature.*

APLOPELTURA LYNNEJOHNSTONEAE SP. NOV.

Holotype: A preserved specimen at the Field Museum of Natural History (FMNH), Chicago, Illinois, USA, specimen number: 143540, collected at Selangor, Peninsular Malaysia. This is a facility that allows access to its holdings.

Paratype: A preserved specimen at the Field Museum of Natural History (FMNH) Chicago, Illinois, USA, specimen number: 183769, collected at Selangor, Peninsular Malaysia.

Diagnosis: *Aplopeltura lynnejohnstoneae sp. nov.* from the lower Malay Peninsula are readily separated from all other species of *Aplopeltura* by having significant melanism on the upper surface of the head, very white upper labials, the white lacking any darker pigment, sheen or flecks as seen in all other species, this being except for a small triangular dark patch under the eye (such a dark patch in one form or other is seen in all species), but which is far narrower than the eye itself in this species, and an indistinct dorsal pattern also defined by the presence of numerous irregular black or blackish flecks throughout.

Aplopeltura shireenae sp. nov. from the main Philippine Islands, including Mindanao, are readily separated from all other *Aplopeltura* species by the following suite of characters: A generally very indistinct dorsal pattern, being a light reddish-brown in colour, the lateral white blotches rising from the belly on the lower flanks are so heavily shaded that they are barely noticeable and this includes for the anterior section of the body, which is only similarly seen in *Aplopeltura lynnejohnstoneae sp. nov.* from the lower Malay Peninsula. *A. shireenae sp. nov.* is separated from *A. lynnejohnstoneae sp. nov.* by several characters including a lack of melanism on the dorsal surface of the head (see in *A. lynnejohnstoneae sp. nov.*) and a lack of the profuse blackish specking seen on the dorsal surface of *A. lynnejohnstoneae sp. nov.*.

The top of the head of *A. shireenae sp. nov.*, while also reddish brown in colour has two distinct white patches somewhat anterior to the eyes, pointing towards the middle of the head, but not meeting. The iris is brownish in colour and characterised by the presence of whitish specks.

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Aplopeltura has 26-55 single subcaudals, versus 88-120 divided subcaudals in *Asthenodipsas* as well as numerous other differences at outlined by Boulenger (1896) in his species-level descriptions.

Distribution: Lower Peninsula Malaysia in a region generally south of Songkhla and Trang, southern Thailand (not including those two named areas).

Etymology: Named in honour of Lynne Johnstone in recognition of her contributions to Australian culture via her long term relationship with lifetime partner Bruce Rogers, of Bend of Islands, Kangaroo Ground, Victoria, Australia, one of the worlds foremost Didgeridoo players and makers, who has been hailed as a hero for Indigenous Australians, even though he was not born as one. In 2015, Bruce Rogers was diagnosed with an aggressive terminal cancer, (Leukemia), and died in July 2016. *Brucerogersus* Hoser, 2012 (type species *Eutaenia chrysocephala* Cope, 1885) is a genus of North American Garter Snakes named in honour of Bruce Rogers.

APLOPELTURA DARANINI SP. NOV.

Holotype: A preserved specimen at the American Museum of Natural History, New York, USA, specimen number: AMNH Herpetology R-2886 collected from Sumatra, Indonesia.

This is a facility that allows access to its holdings.

Diagnosis: *Aplopeltura daranini sp. nov.* from Sumatra is readily separated from all other species of *Aplopeltura* by being similar in most respects to *A. lynnejohnstoneae sp. nov.* (as defined in the description preceding or within this one, below), but by the following obvious differences. It has an orange sheen or peppering over the white upper labials so that they do not appear to be an immaculate white in colour, as well as the markings of the iris. In *A. lynnejohnstoneae sp. nov.* the iris is more-or-less of one colour being a brownish colour, wheras in *A. daranini sp. nov.* the iris is generally whitish in colour, but with darker reddish veins or markings running more-or-less radially out from the centre. On *A. daranini sp. nov.* the indistinct dorsal pattern is defined by the presence of irregular black spots as opposed to smaller blackish flecks as seen in *A. lynnejohnstoneae sp. nov.*.

Aplopeltura lynnejohnstoneae sp. nov. from the lower Malay Peninsula are readily separated from all other species of *Aplopeltura* by having significant melanism on the upper surface of the head, very white upper labials, the white lacking any darker pigment, sheen or flecks as seen in all other species, this being except for a small triangular dark patch under the eye (such a dark patch in one form or other is seen in all species), but which is far narrower than the eye itself in this species, and an indistinct dorsal pattern also defined by the presence of numerous irregular black or blackish flecks throughout.

Aplopeltura shireenae sp. nov. from the main Philippine Islands, including Mindanao, are readily separated from all other *Aplopeltura* species by the following suite of characters: A generally very indistinct dorsal pattern, being a light reddish-brown in colour, the lateral white blotches rising from the belly on the lower flanks are so heavily shaded that they are barely noticeable and this includes for the anterior section of the body, which is only similarly seen in *Aplopeltura lynnejohnstoneae sp. nov.* from the lower Malay Peninsula. *A. shireenae sp. nov.* is separated from *A. lynnejohnstoneae sp. nov.* by several characters including a lack of melanism on the dorsal surface of the head (see in *A. lynnejohnstoneae sp. nov.*) and a lack of the profuse blackish specking seen on the dorsal surface of *A. lynnejohnstoneae sp. nov.*.

The top of the head of *A. shireenae sp. nov.*, while also reddish brown in colour has two distinct white patches somewhat anterior to the eyes, pointing towards the middle of the head, but not meeting. The iris is brownish in colour and characterised by the presence of whitish specks.

Aplopeltura boa (Boie, 1828) from Java is readily separated from others in the genus (as defined herein) by significant somewhat irregular shaped white patches along the dorsal midline. The dark patch below the eye that commences on the jawline, does not extend as far as the eye or if so, only just intersects it.

Aplopeltura omarelhelou sp. nov. from southern Thailand on the Isthumus of Kra in the region generally north of and including Songkhla and Trang are readily separated from those on the lower Malay Peninsula (*A. lynnejohnstoneae sp. nov.*) and all other species of *Aplopeltura* by the well defined whitish etchings on the rear margins of otherwise darker labials.
A. omarelhelou sp. nov. are also separated from the other species by the obvious dark purplish red markings on the head and dorsal surface.

White markings in the form of irregular shaped, but vaguely triangular blotches are very distinct and well defined in *A. omarelhelou sp. nov.*, as opposed to being either moderately well-defined or poorly defined in all other species.
Aplopeltura gibbonsi sp. nov. from Borneo is separated from all other *Aplopeltura* by the following characters: Having a reasonably distinct dorsal pattern consisting of irregular markings or blotches on the dorsal surface, the most obvious ones being an orangeish red in colour. The white markings on the lower flanks and white parts of the upper labials are heavily peppered making them appear to be off-white and a shade of the peppering, or alternatively fully shaded as another colour anyway (e.g. yellow). The dark patch under the eye is also well-

broken by one or more streaks of white pigment, this also being well peppered or shaded by a colour such as yellow, orange or red.

Members of the family Pareidae (alternatively referred to as the Pareatidae) are unique among Southeast Asian snakes and diagnosed in having large scales overlapping on their chins rather than having them separated by a straight groove. These snakes are known to feed mainly on terrestrial molluscs.

They have short skulls; relatively large eyes; a large nasal gland; have a relatively low number of scales at mid body (13-15 rows); the chin shields have no midline groove, and extend across the chin; they are nocturnal; they feed mostly upon gastropods and small vertebrates; and they lay eggs.

The maxillary bone is very short, deep and with 5 or 6 subequal mandibular teeth gradually decreasing in length. The head is distinct from the neck; eye moderate, with a vertical pupil; nasal single. Body more or less compressed; scales smooth or feebly keeled, without pits, more or less oblique, in 13-15 rows, vertebral row may be enlarged or not (depending on the genus). Ventrals rounded. Tail moderate or short; subcaudals divided.

Observations on captive and wild snakes eating snails suggests that they rest the upper jaw on a snail (preferred food) and use the mandibles to pull the snail's body out of its shell. These are thought to represent a basal lineage of the advanced snakes (Caenophidia).

There are 4 recognized genera and about 15 species currently recognized (before the publication of this paper), all inhabiting Southeast Asia.

Genus *Aplopeltura* Duméril, 1838 has until now been treated as being monotypic for the species *A. boa* (Boie, 1828), but split six ways in this paper, with five new species formally named.

Snakes in the genera *Aplopeltura* Duméril, 1838 and *Asthenodipsas* Peters, 1864 are considerably thinner in build and show significant vertical compression (also seen as a distinct midline ridge along the back), that is not seen in *Pareas* Wagler, 1830 or *Katrinahoserserpenea* Hoser, 2012 as recognized to date.

Aplopeltura has 26-55 single subcaudals, versus 88-120 divided subcaudals in *Asthenodipsas* as well as numerous other differences at outlined by Boulenger (1896) in his species-level descriptions.

Distribution: Known only from the hillier sections of the island of Sumatra, Indonesia and mainly in the north.

Etymology: Named in honour of Dara Nin of Ringwood, Victoria, Australia in recognition of a decade's valuable wildlife conservation and education work with Snakebusters: Australia's best reptile displays, being the only wildlife display in Australia that lets people hold the animals, as opposed to boring static displays done by less experienced imitators, this being the sworn evidence of Ronald Leslie Waters, a former head of wildlife law enforcement at the Department of Sustainability and Environment in Victoria (AKA DSE), in a court of law in 2015 (VCAT 2015).

APLOPELTURA GIBBONSI SP. NOV.

Holotype: A preserved specimen at the Field Museum of Natural History, Chicago, Illinois, USA, specimen number: FMNH Amphibians and Reptiles 246150, collected at Sabah, Borneo, Malaysia.

The Field Museum of Natural History, Chicago, Illinois, USA, allows access to its holdings.

Paratypes: Three preserved specimens at the Field Museum of Natural History, Chicago, Illinois, USA, specimen numbers: FMNH Amphibians and Reptiles 246149, 246146 and 246151, collected at Sabah, Borneo, Malaysia.

Diagnosis: *Aplopeltura gibbonsi sp. nov.* from Borneo is separated from all other *Aplopeltura* species by the following suite of characters: Having a reasonably distinct dorsal pattern consisting of irregular markings or blotches on the dorsal surface, the most obvious ones being an orangeish red in colour. The white markings on the lower flanks and white parts of the upper labials are heavily peppered making them appear to be off-white and a shade of the peppering, or alternatively fully shaded as another colour anyway (e.g. yellow). The dark patch under the eye is also well-broken by one or more streaks of white pigment, this also being well peppered or shaded by a colour such as yellow, orange or red.

Aplopeltura lynnejohnstoneae sp. nov. from the lower Malay Peninsula are readily separated from all other species of *Aplopeltura* by having significant melanism on the upper surface of the head, very white upper labials, the white lacking any darker pigment, sheen or flecks as seen in all other species, this being except for a small triangular dark patch under the eye (such a dark patch in one form or other is seen in all species), but which is far narrower than the eye itself in this species, and an indistinct dorsal pattern also defined by the presence of numerous irregular black or blackish flecks throughout.

Aplopeltura shireenae sp. nov. from the main Philippine Islands, including Mindanao, are readily separated from all other *Aplopeltura* species by the following suite of characters: A generally very indistinct dorsal pattern, being a light reddish-brown in colour, the lateral white blotches rising from the belly on the lower flanks are so heavily shaded that they are barely noticeable and this includes for the anterior section of the body, which is only similarly seen in *Aplopeltura lynnejohnstoneae sp. nov.* from the lower Malay Peninsula. *A. shireenae sp. nov.* is separated from *A. lynnejohnstoneae sp. nov.* by several characters including a lack of melanism on the dorsal surface of the head (see in *A. lynnejohnstoneae sp. nov.*) and a lack of the profuse blackish specking seen on the dorsal surface of *A. lynnejohnstoneae sp. nov.*.

The top of the head of *A. shireenae sp. nov.*, while also reddish brown in colour has two distinct white patches somewhat anterior to the eyes, pointing towards the middle of the head, but not meeting. The iris is brownish in colour and characterised by the presence of whitish specks.

Aplopeltura boa (Boie, 1828) from Java is readily separated from others in the genus (as defined herein) by significant somewhat irregular shaped white patches along the dorsal midline. The dark patch below the eye that commences on the jawline, does not extend as far as the eye or if so, only just intersects it.

Aplopeltura omarelhelou sp. nov. from southern Thailand on the Isthumus of Kra in the region generally north of and including Songkhla and Trang are readily separated from those on the lower Malay Peninsula (*A. lynnejohnstoneae sp. nov.*) and all other species of *Aplopeltura* by the well defined whitish etchings on the rear margins of otherwise darker labials.
A. omarelhelou sp. nov. are also separated from the other species by the obvious dark purplish red markings on the head and dorsal surface.

White markings in the form of irregular shaped, but vaguely triangular blotches are very distinct and well defined in *A. omarelhelou sp. nov.*, as opposed to being either moderately well-defined or poorly defined in all other species.
Aplopeltura daranini sp. nov. from Sumatra is readily separated from all other species of *Aplopeltura* by being similar in most respects to *A. lynnejohnstoneae sp. nov.* as defined above, but by the following obvious differences. It has an orange sheen or peppering over the white upper labials so that they do not appear to be an immaculate white in colour, as well as the markings of the iris. In *A. lynnejohnstoneae sp. nov.* the iris is more-or-less of one colour being a brownish colour, wheras in *A. daranini sp. nov.* the iris is generally whitish in colour, but with darker reddish veins or markings running more-or-less radially out from the centre. On *A. daranini sp. nov.* the indistinct dorsal pattern is defined by the presence of irregular black spots as opposed to smaller blackish flecks as seen in *A. lynnejohnstoneae sp. nov.*.

Members of the family Pareidae (alternatively referred to as the

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Pareatidae) are unique among Southeast Asian snakes and diagnosed in having large scales overlapping on their chins rather than having them separated by a straight groove. These snakes are known to feed mainly on terrestrial molluscs.

They have short skulls; relatively large eyes; a large nasal gland; have a relatively low number of scales at mid body (13-15 rows); the chin shields have no midline groove, and extend across the chin; they are nocturnal; they feed mostly upon gastropods and small vertebrates; and they lay eggs.

The maxillary bone is very short, deep and with 5 or 6 subequal mandibular teeth gradually decreasing in length. The head is distinct from the neck; eye moderate, with a vertical pupil; nasal single. Body more or less compressed; scales smooth or feebly keeled, without pits, more or less oblique, in 13-15 rows, vertebral row may be enlarged or not (depending on the genus). Ventrals rounded. Tail moderate or short; subcaudals divided.

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There are 4 recognized genera and about 15 species currently recognized (before the publication of this paper), all inhabiting Southeast Asia.

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Snakes in the genera *Aplopeltura* Duméril, 1838 and *Asthenodipsas* Peters, 1864 are considerably thinner in build and show significant vertical compression (also seen as a distinct midline ridge along the back), that is not seen in *Pareas* Wagler, 1830 or *Katrinahoserserpenea* Hoser, 2012 as recognized to date.

Aplopeltura has 26-55 single subcaudals, versus 88-120 divided subcaudals in *Asthenodipsas* as well as numerous other differences at outlined by Boulenger (1896) in his species-level descriptions.

Distribution: The island of Borneo, Malaysia, Brunei and Indonesia, mainly in the hiller parts of the north and immediately adjacent areas.

Etymology: Named in honour of Dale Gibbons of Maiden Gully, on the outskirts of Bendigo, Victoria, Australia in recognition of a lifetime's work with wildlife conservation and herpetology, including captive breeding of rare and threatened species as well as a significant contribution to field work and surveys throughout the Australian state of Victoria.

PAREAS CARINATUS SUMATRENSIS SUBSP. NOV.

Holotype: A preserved specimen at the Museum of Comparative Zoology, Harvard University in Cambridge, Massachusetts, USA, specimen number: MCZ:Herp:R-37764, collected at Langhat, north-east coast of Sumatra, Indonesia, Latitude 3.98,, Longitude 98.48.

The Museum of Comparative Zoology, Harvard University in Cambridge, Massachusetts, USA, allows access to its holdings.

Paratype: A preserved specimen at the National Museum of Natural History (USA), formerly known as the US National Museum, administered by the Smithsonian Institution, Washington, D.C., USA, specimen number: USNM 103582.6076586, collected from Utara, Sumatra, Indonesia.

Diagnosis: *Pareas carinatus sumatrensis sp. nov.* from Sumatra is readily separated from all other subspecies by the presence of extensive peppering on the light upper labials and head. The same peppering extends along the upper forebody.

Nominate *P. carinatus carinatus* from Java and islands east of there, are separated from the other subspecies by a temporal streak on each side, merging to form a short thick black band on the back of the head and neck, which at the posterior end extends down the flanks to immediately above the ventrals. In line with the other subspecies, the dorsal pattern beyond this point is one of alternating semi-destinct blackish crossbands interspersed with wider areas of dark brown or greyish brown.

On the forebody of *P. carinatus sumatrensis subsp. nov.* from Sumatra, the lighter dorsal crossbands are significantly wider than the darker ones, versus the reverse situation (or roughly equal size) as seen in nominate *P. carinatus carinatus* from Java, or those from Peninsula Malaysia, herein named as *P. carinatus malayensis subsp. nov.*.

P. carinatus nuchalis (Boulenger, 1890) from Borneo, are readily distinguished from the other subspecies by the obvious melanism (blackish colouration) of the head and neck, meaning the temporal streak is either hidden or not obvious, the fact that the dark blackish bands are distinct and extend quite clearly down the flanks to the ventral surface, and usually have individual white scales on the spine at the forebody being noticeably lighter in colour, forming a semi-distinct dotted vertebral stripe.

P. carinatus unicolor Bourret, 1934 from Cambodia are separated from the other subspecies by the fact that the darker crossbands are significantly obscured on the mid flanks being near absent at this point. The mid and rear upper labials are also characterised by dark etching (usually dark brown) on the scale margins.

There is also an unsual unicolour phase in the range for *P. carinatus unicolor* Bourret, 1934, not seen elsewhere.
P. carinatus malayensis subsp. nov.. from Peninsula Malaysia and nearby places further north are similar in most respects to *P. carinatus carinatus* but are separated from that subspecies by the absence of the temporal streak on each side merging to form a short thick black band on the back of the head and neck, which at the posterior end extends down the flanks to immediately above the ventrals.

P. carinatus malayensis subsp. nov.. are further separated from the other subspecies by either the absence of a well defined temporal streak, or alternatively one that is relatively indistinct.

Snakes of the genus *Pareas* as presently recognized consists of (about) just one species as defined herein and are diagnosed by being small and slender with a blunt snout, no mental groove and no teeth on the anterior part of the maxillary.

Snakes in the genera *Aplobeltura* Duméril, 1853 and *Asthenodipsas* Peters, 1864 are considerably thinner in build and more vertically compressed than seen in *Pareas* and *Katrinahoserserpenea* Hoser, 2013 as recognized to date.

Pareas has since 2012 been restricted to the species taxa *P. carinatus* and putative *P. nuchalis*, treated here as a subspecies of one another, along with the other forms identified herein.

Those taxa differ from taxa in the genus *Katrinahoserserpenea* by cephalic scalation and distribution pattern.

P. carinatus sensu lato (including putative *P. nuchalis* and other forms identified above) share three anterior temporals in contrast to the one or two (rarely three) anterior temporals in *Katrinahoserserpenea* species.

The frontal scale in *P. carinatus sensu lato* (including putative *P. nuchalis* and other forms identified above) is hexagonal with the lateral sides parallel to the body axis; this scale in *Katrinahoserserpenea* is almost diamond-shaped or shield-shaped with the lateral sides converging posteriorly.

The two anterior chin shields are longer than broad in *Katrinahoserserpenea*, whereas in *Pareas* they are broader than long; this is a consistent way to separate the two genera.

The snakes remaining in the genus *Pareas* occur mainly throughout the Indochinese Peninsula and Sunda Islands. By contrast most species of *Katrinahoserserpenea* occur in central and southern China and the northern Indochinese Peninsula, with only two species, *Katrinahoserserpenea margaritophorus* and *K. hamptoni* being found in the southern Indochinese Peninsula.

Distribution: Hillier parts of Sumatra, Indonesia and nearby areas, including most of the northern quarter of the island and the hills and mountains running along the western side of the island.

Etymology: Named in reflection of where they naturally occur.

PAREAS CARINATUS MALAYENSIS SUBSP. NOV.

Holotype: A preserved specimen at the California Academy of Science, San Francisco, USA, specimen number: CAS:HERP:73696, collected at Patani, southern Thailand.

The California Academy of Science, USA allows access to its holdings

Diagnosis: *P. carinatus malayensis subsp. nov..* from Peninsula Malaysia are similar in most respects to *P. carinatus carinatus* (see below) but are separated from that subspecies by the absence of the temporal streak on each side merging to form a short thick black band on the back of the head and neck, which at the posterior end extends down the flanks to immediately above the ventrals.

P. carinatus malayensis subsp. nov.. are further separated from the other subspecies by either the absence of a well defined temporal streak, or alternatively one that is relatively indistinct.

Nominate *P. carinatus carinatus* from Java and islands east of there are separated from the other subspecies by a temporal streak on each side, merging to form a short thick black band on the back of the head and neck, which at the posterior end extends down the flanks to immediately above the ventrals. In line with the other subspecies, the dorsal pattern beyond this point is one of alternating semi-destinct blackish crossbands interspersed with wider areas of dark brown or greyish brown.

On the forebody of *P. carinatus sumatrensis subsp. nov*. from Sumatra, the lighter dorsal crossbands are significantly wider than the darker ones, versus the reverse situation (or roughly equal size) as seen in nominate *P. carinatus carinatus* from Java, or those from Peninsula Malaysia, herein named as *P. carinatus malayensis subsp. nov..*

Pareas carinatus sumatrensis sp. nov. is readily separated from all other subspecies by the presence of extensive peppering on the light upper labials and head. The same peppering extends along the upper forebody.

P. carinatus nuchalis (Boulenger, 1890) from Borneo are readily distinguished from the other subspecies by the obvious melanism (blackish colouration) of the head and neck, meaning the temporal streak is either hidden or not obvious, the fact that the dark blackish bands are distinct and extend quite clearly down the flanks to the ventral surface, and usually have individual white scales on the spine at the forebody being noticeably lighter in colour, forming a semi-distinct dotted vertebral stripe.

P. carinatus unicolor Bourret, 1934 from Cambodia are separated from the other subspecies by the fact that the darker crossbands are significantly obscured on the mid flanks being near absent at this point. The mid and rear upper labials are also characterised by dark etching (usually dark brown) on the scale margins.

There is also an unsual unicolour phase in the range for *P. carinatus unicolor* Bourret, 1934, not seen elsewhere.
Snakes of the genus *Pareas* as presently recognized consists of about just one species as defined herein and are diagnosed by being small and slender with a blunt snout, no mental groove and no teeth on the anterior part of the maxillary.

Snakes in the genera *Aplobeltura* Duméril, 1853 and *Asthenodipsas* Peters, 1864 are considerably thinner in build and more vertically compressed than seen in *Pareas* and *Katrinahoserserpenea* Hoser, 2013 as recognized to date.

Pareas has since 2012 been restricted to the species taxa *P. carinatus* and putative *P. nuchalis*, treated here as a subspecies.

Those two species differ from taxa in the genus *Katrinahoserserpenea* by cephalic scalation and distribution pattern.

P. carinatus sensu lato (including putative *P. nuchalis* and other relevant taxa) share three anterior temporals in contrast to the one or two (rarely three) anterior temporals in *Katrinahoserserpenea* species.

The frontal scale in *P. carinatus sensu lato* (including putative *P. nuchalis* and other relevant taxa) is hexagonal with the lateral sides parallel to the body axis; this scale in *Katrinahoserserpenea* is almost diamond-shaped or shield-shaped with the lateral sides converging posteriorly.

The two anterior chin shields are longer than broad in *Katrinahoserserpenea*, whereas in *Pareas* they are broader than long; this is a consistent way to separate the two genera.

The snakes remaining in the genus *Pareas* occur mainly throughout the Indochinese Peninsula and Sunda Islands. By contrast most species of *Katrinahoserserpenea* occur in central and southern China and the northern Indochinese Peninsula, with only two species *Katrinahoserserpenea margaritophorus* and *K. hamptoni* being found in the southern Indochinese Peninsula.

Finally I note that *P. carinatus malayensis subsp. nov.* is a legally available name under the rules of the the *International Code of Zoological Nomenclature* (Ride *et al*. 1999). The name *Malayopython* Reynolds *et al.* (2013a, b and 2014) is not!

See Hoser (2015) for the details.

Distribution: The lower Malay Peninsula, Asia, extending north along most of the Isthumus of Kra.

Etymology: Named in reflection of where they naturally occur.

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CONFLICT OF INTEREST

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