

A RECLASSIFICATION OF THE PYTHONINAE INCLUDING THE DESCRIPTIONS OF TWO NEW GENERA, TWO NEW SPECIES AND EIGHT NEW SUBSPECIES

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ABSTRACT

As a result of a reclassification of the Pythoninae, this paper now splits the group into sixteen genera, including all those used by Hoser (2000) and two resurrected from the synonymy of the catch-all genus "*Python*", namely *Aspidoboa* from Asia and *Helionomus* from Africa. Furthermore two new genera have been erected for the *reticulatus* and *anchietae* groups, that had also been formerly placed within the genus *Python*.

These are *Broghammerus* gen. nov. and *Shireenhoserus* gen. nov. respectively.

This paper describes two new species of *Morelia* from South Australia, bringing the known total of python species to 42.

There are six new regional subspecies of *Broghammerus reticulatus* (previously known as *Python reticulatus*) formally described and named, as well as a new subspecies of *Chondropython viridis* and a new subspecies of *Katrinus fuscus* described and named. It is anticipated that further subspecies of *Broghammerus* in particular as well as other pythons await diagnosis and formal description.

This paper also lists all 42 recognised species as of 2002, including those most recently described by this and other authors.

INTRODUCTION AND MATERIALS AND METHODS

The "true" pythons of Africa, Asia and Australasia are generally placed in the sub-family Pythoninae.

The classification of the pythoninae as defined by Romer (1956) p. 572, has in recent years been the subject of intense debate. The pythoninae are separated from the boinae by the presence of a supraorbital bone and other characters (McDowall 1975).

There have also been numerous published studies detailing the morphology and biochemistry of the pythoninae and related snakes.

Notwithstanding this vast body of available evidence the taxonomic arrangements used in the past by most authors have been generally inconsistent across the group. By contrast, this paper consistently applies the same principals across the entire group as best as is possible. It does not attempt to rehash other researchers findings of fact.

Due to a number of factors including the commercial significance of these snakes, their generally large size and popularity among hobbyist keepers, there have been numerous studies into the taxonomy of these snakes.

Furthermore, there has also been a vast amount of previously unreported or relatively little-known information about the pythoninae published in other scientific and popular literature, including in such publications as: Banks (1974, 1980), Barker and Barker (1994a, 1994b, 1995, 1999), Barnett (1979, 1987, 1993, 1999), Broghammer (2001), Bullian (1994), Chiras (1982), Comber (1999), Covacevich and Limpus (1973), Cox (1991), David and Vogel (1996), Dunn (1979), Ehmann (1992), Fearn (1996), FitzSimmons (1970), Gharpurey (1962), Gow (1977, 1981, 1989), Greer (1997), Heijden (1988), Hoser (1981a, 1981b, 1981c, 1982, 1988, 1989, 1990, 1991a, 1991b, 1992, 1993a, 1993b, 1995, 1996, 1999a, 1999b, 1999c, 1999d), Kend (1992, 1997), Kend and Kend (1992), Kortlang (1989), Krauss (1995), Maguire (1995), Martin (1973), Maryan (1984), Maryan and George (1998), Mattison (1980), Mavromichalis and Bloem (1994), McDowell (1984),

McLain (1980), Mirtschin and Davis (1992), Murdoch (1999), O'Shea (1996), Reitinger (1978), Romer (1956), Rooyendijk (1999), Ross (1973, 1978), Ross and Marzec (1990), Schwaner and Dessauer (1981), Sheargold (1979), Shine (1991), Shine, Ambariyanto, Harlow, Mumpuni, (1998), Smith (1981a, 1981b, 1985), Sonneman (1999), Storr, Smith and Johnstone (1986), Stull (1932, 1935), Thomson (1935), Webber (1978), Weigel (1988), Wells and Wellington (1983, 1985), Williams (1992), Wilson and Knowles (1988), Worrell (1951, 1970) and the many further sources of information referred to directly in these publications.

This forms an enormous database of information on these snakes.

As a result of this continual inflow of new information, there have been numerous taxonomic arrangements proposed for these snakes at both the genus and species levels.

As a result, calls by the ICZN for stability of nomenclature as per their rules (Ride et. al. 1999 and earlier ICZN publications) have effectively been ignored in terms of this group of reptiles.

Thus it is appropriate for a classification to be adopted that more accurately reflects the true phylogeny of the pythoninae, even if it results in previously unused names being used and there being some short-term difficulty by other herpetologists in terms of getting used to the newer and more accurate nomenclature.

In recent times (the last 20 years) and at it's most conservative, the pythoninae has been deemed to consist of just three genera, namely *Aspidites*, *Morelia* and *Python*, by authors such as Ingram and Raven (1991) and Welch (1994).

However, most herpetologists (e.g. Greer (1997) or Wells and Wellington (1985)), including this author, find the above arrangement untenable and this paper accepts the alternative arrangement, which must involve an unbiased splitting of the genera *Morelia* and *Python* as recognised by Ingram and Raven (1991) and Welch (1994). Hence an expansion here of the earlier arrangement of Hoser (2000).

The placement of the Woma and Black-headed Pythons

(*Aspidites ramsayi* and *Aspidites melanocephalus*) into the relatively distinct genus *Aspidites*, has been uncontroversial and accepted by all modern herpetologists and is not further discussed in this paper.

It's generally agreed that this group diverged from the other pythons a long way back in the geological past and well before the rest of the pythoninae diverged. *Aspidites* are thought to be the most primitive of the pythoninae due to their lacking labial pits.

Further reference to Australasian pythons in this paper should be taken to ignore that genus and instead refer to all the other species (unless otherwise stated).

Other classification systems adopted have in turn split the latter two genera (*Morelia* and *Python*) into numerous genera each consisting of one or more closely related species.

Recent taxonomic studies invoking DNA techniques have indicated that it is in fact more reasonable to split the latter two genera into the various species groups as recognised by earlier authors such as McDowall (1975), Wells and Wellington (1985) and more recently Hoser (2000).

Most of the various taxonomic arrangements for the pythoninae have invariably looked at these snakes on a regional basis only (like Wells and Wellington (1985) or Hoser (2000)), and while generally consistent in their approaches, have by their nature ignored taxa found outside their target area.

The relatively few publications dealing with pythoninae taxonomy on a world-wide basis have either tended to (in hindsight) be overly conservative in lumping most species into the catch-all genus "*Python*", or been generally inconsistent in terms of the criteria used to define a genus and then assign species to them.

This same pattern has been particularly evident in the popular literature, which adopts a "splitting" (*sensu stricto*) approach in terms of the Australasian species by subdividing the species into various genera including such as *Liasis*, *Bothrochilus* and *Morelia*, while simultaneously ignoring similar splits of the African and Asian pythons from the single "*Python*" (*sensu lato*) into the formally named subgroups (genera) of *Aspidoboa*, *Helionomus* and *Python*, (e.g. Stafford 1986), or even a simple and obvious splitting of the "*Python*" group into the *molurus* and *reticulatus* groups as so eloquently identified by McDowall (1975).

This paper is the first paper to propose a classification system for all the pythoninae, reflecting more modern views of what should be included in a given genus and taking into account recent studies on the taxonomy of the pythoninae as a whole and the various well-defined species groups.

This paper is also consistent in that it also follows on the trend of recent splits of other reptile genera which had formerly been regarded as single into two or more genera, based on distinct groups of reptiles within a genera, separated easily on the basis of size class (big versus small) and obvious and very different differences in morphology, scalation and biology.

There are numerous such examples including: Couper, Covacevich and Moritz (1993), who split the gekkonid genus *Phyllurus* into two based on the above criteria, Hoser (1998) who split the elapid genus *Cannia* into two also based on similar criteria. Then there is the most obvious and now widely accepted splitting of "*Liasis*" into more than one genus including the new genus *Antaresia* (Wells and Wellington 1983), which is identified popularly as the "small *Liasis*" and separated most easily from the others on the basis of their radically different adult size.

Greer (1997) and others have accepted this proposition and the name *Antaresia* is now in general usage.

Among the better known taxonomic studies in recent times dealing specifically with the Pythoninae are Harvey, Barker, Ammerman and Chippendale. (2000), Keogh, Barker and Shine (2001), Kluge (1993), McDowall (1975) and Underwood and Stimson (1990).

This paper draws on the findings of fact by these papers and the other publications cited at the rear of this paper to make the classification given below, but as a rule does not rehash these findings here as the facts themselves are generally not in dispute.

The classification system proposed is consistent with that of Hoser (2000), however unlike that paper, it deals with the status of all pythons and not just those from the Australia/New Guinea region.

This paper also builds on the taxonomy of Harvey, Barker, Ammerman and Chippendale. (2000) for the genus *Australiasis*, which was omitted from the paper Hoser (2000) following an earlier request from one of the authors, David Barker.

The taxonomy of Harvey, Barker, Ammerman and Chippendale. (2000) is accepted almost in toto at the species level, save for the resurrection of the species *duceboracensis* (Gunther, 1879) from the synonymy of *amethystina* (Schneider, 1801). Furthermore, unlike Harvey, Barker, Ammerman and Chippendale. (2000), this author regards Australian *Australiasis* as subspecific to southern New Guinea *Australiasis amethystina*. The correct terminology for that taxon is *Australiasis amethystinus clarki* (Barbour, 1914), not "*kinghorn*", which is effectively a junior synonym.

The central thrust of this paper is that the allocation of given species to given genera should be consistent across the pythoninae, regardless of which region the species occurs.

As a result, in the classification that follows, one will see the resurrection of old and/or little-known generic names and the formal naming of two new python genera.

This paper does not purport to be a comprehensive review of all pythoninae species and subspecies. The author believes that further taxa will be formally described at both the species and subspecies level in years to come and that taxa treated here as subspecies may ultimately be generally accepted as full species, as has already been seen for some of the taxa described by Hoser (2000) by people such as Wells (2002).

Diagnostic information for the Australasian genera as named in Hoser (2000), namely *Aspidites* Peters 1876, *Antaresia* Wells and Wellington 1983, *Australiasis* Wells and Wellington 1983, *Bothrochilus* Fitzinger 1843, *Chondropython* Meyer 1874, *Katrinus* Hoser 2000, *Leiopython* Hubrecht 1879, *Lenhoserus* Hoser 2000, *Liasis* Gray 1840, *Morelia* Gray 1842, *Nyctophilopython* Wells and Wellington 1985 is not repeated in this paper. That paper is on the internet at the url <http://www.smuggled.com/pytrev1.htm> and is also available from that site as pdf in the same format as originally published.

For detailed diagnostic information about the genera named in the previous paragraph, readers are hereby directed to the original descriptions as cited and/or the popular literature which more than adequately separates the best known component species as cited at the rear of this paper. This paper does not amend the taxonomy used in the paper Hoser (2000), save for the addition of more recently described species and/or subspecies. The taxonomy used in Hoser (2000) has been widely adopted in the two years since publication. Examples include: Clark

2002, Kuroski 2001 and 2002 (all for *Morelia harrisoni*), and Schleich 2001 (for the various subspecies of *L. albertisi*) as named formally by Hoser (2000).

In this paper is a list of all currently recognised genera and species and subspecies of python, including the two genera formally named for the first time, namely *Shireenhoserus* gen. nov. and *Broghammerus* gen. nov. and the newly named species and subspecies.

RELEVANT DISCUSSION AND COMMENTS

The following is directly relevant to the formal descriptions that follow, the general taxonomy used and forms a part of the descriptions and this paper.

The list as follows in itself shows the taxonomic conclusions made by this author.

However a few other comments in this regard are warranted.

Two genera of snakes, namely *Loxocemus* and *Calabaria* are not closely related to other python genera and were removed from the Pythoninae in 1976 by Underwood. They are now placed in different subfamilies or in a different family altogether.

More recent evidence (including Heise, et. al. (1995) p. 261, Fig. 1.) confirms this move by Underwood and those two genera have been effectively ignored for the purposes of this paper.

Calabaria are readily separated from all true pythons (excluding *Aspidites* from Australia) by their more-or-less cylindrical body shape and the fact that their head is not distinct from the neck as in true pythons (again excluding *Aspidites*).

Aspidites can be readily separated by their yellowish brown body colour and dorsal pattern with a tendency towards distinct or indistinct transverse banding. By contrast for *Calabaria* the dorsal colour in *Calabaria* is a more dark and reddish brown and the pattern is not tending towards transverse banding in any way.

The results of Heise, et. al. (1995) also suggests that the old-world Pythoninae should in fact be elevated to the level of family, thereby excluding the boids from the new world, who in turn should be placed into a separate family. Likewise for the Calabariinae from Africa and Loxoceminae from North America.

The relationships of the subfamilies Bolyeriinae, and Erycinae with respect to the other "boids" remains generally uncertain, but it is obvious that they do not form a part of the Pythoninae.

This author agrees with Stimson (1969) p. 28, in designating *molurus* the type species for the genus *Python*.

The past moves by Kluge (1993) to make *Katrinus mackloti* and *Katrinus fuscus* synonymous were rejected by this author in Hoser (2000) and have been corroborated by other authors (again see Hoser (2000)). Likewise for Kluge's (1993) erection of the genus *Apodora* to accommodate the species *Liasis papuana* (see also below).

The evidence does not support the position of Kluge (1993).

Neither move is to be taken as a personal attack against Arnold Kluge in any way.

The results and data as published by Underwood and Stimson (1990) p. 592 top and elsewhere in the same paper and several more recent critiques of the same paper give unequivocal support for the erection of the genus *Katrinus* by Hoser (2000) and to a lesser extent give support to the erection of the genus *Lenhoserus* by Hoser (2000) if one is to accept the proposition that the species *viridis* should be separated from the other *Morelia* and

placed into its own genus *Chondropython*, and/or that the Scrub Pythons (*Australiasis*) should be placed in a genus on their own apart from *Morelia* and *Chondropython*.

Harvey, Barker, Ammerman and Chippendale (2000) provided sufficient evidence for the formal recognition of *Australiasis duceboracensis* (Gunther, 1879) from New Ireland in the Bismark Archipelago to be recognised as a full species (as opposed to being merely a local variant of *Australiasis amethystina*), but in the end of the paper failed to make this obvious move.

Hence its inclusion in the list here.

In further explanation of this move, this author notes that an analysis of the cytochrome *b* mitochondrial DNA sequence by Harvey, Barker, Ammerman and Chippendale (2000) for the Bismark Islands form showed a 5% divergence from the nominate New Guinea form.

In a later paper by Keogh, Barker and Shine (2001), two other python species (namely *breitensteini* and *curtus*) were confirmed as being distinct at the species level with a mere 3% divergence of the same cytochrome *b* mitochondrial DNA sequence using the same test.

It didn't escape this author's notice that David Barker was a co-author of both papers and hence one finds it hard to otherwise reconcile this inconsistency.

No disrespect is implied here, however it is important that the inconsistency be appropriately corrected.

Harvey, Barker, Ammerman and Chippendale (2000) also called for the designation of a neotype for *Australiasis amethystina*. That call is agreed by this author. The data provided by Harvey, Barker, Ammerman and Chippendale (2000) and obtained independently by this author confirms that the "*Australiasis amethystina*" from north of the central divide in New Guinea are different to the southern form, at least to subspecies level, which is a situation mirrored in the snakes of the genera *Acanthophis* and *Leiopython* who have similar distributions in this region (see Hoser (1998a) and Hoser (2000) respectively).

This author was going to formally name this form of *Australiasis* at the subspecies level, but has deferred doing so, pending advice that others were independently working on doing this. Hence this taxa will be ignored for the purposes of this paper and the list that follows.

In the absence of a neotype and any evidence to the contrary, this author assumes that the species name "*dipsadides*" from south of the central divide in New Guinea is merely a junior synonym of *amethystina*.

The African species name "*saxuloides*" (Miller and Smith 1979) is merely a junior synonym for the species *sebae*. Also see Broadley (1984).

The obvious physical character differences between the smaller species of Asiatic and African pythons from the larger species (herein listed as: *Python*, *Helionomus* and *Broghammerus* gen. nov.) and the lack of any recent evidence of common ancestry make a compelling case for the resurrection of and creation of a total of two new genera to accommodate the Asian and African species respectively.

Again refer to the examples of: Couper, Covacevich and Moritz (1993), Hoser (1998), Wells and Wellington (1983) to show that the move indicated by this author is consistent with the modern scientific viewpoint.

The species within each of the five relevant genera *Python*, *Aspidoboa*, *Helionomus*, *Broghammerus* gen. nov. and *Shireenhoserus* gen. nov. can all be separated from one another by the differences in the following character states in combination: number of and position of labial pits, average adult size, general build, typical head mark-

ings and body colouration, breeding biology and average relative egg size and number, head and body scalation. A cursory examination of the relevant component species will more than adequately establish this fact.

These characteristics for each species are detailed in general regional texts, including those cited at the end of this paper.

NOTES ON THE DESCRIPTIONS OF NEW SUBSPECIES IN THIS PAPER

Should at some future stage any herpetologist choose for their own purposes to recognize some but not all of the subspecies listed for the first time in this paper and/or elevate some to the status of full species, thereby perhaps making others junior synonyms at the species level, then the names that take precedence should be those that are given first in this paper (by alphabetical order).

Specifically in relation to the regional variants of *Broghammerus* gen. nov., these are in many ways like those of *Morelia* or *Australiasis* in that most specimens of a given species or subspecies can fairly easily be referred to a given taxa on appearance alone, once a person is familiar with them. But due to the huge degree of variation within a single population, this is not always the case, hence the need to retain good locality data for specimens and/or the need for relevant genetic tests if necessary.

In terms of the subspecies listed below, this author's investigations have led to the inescapable conclusion that all are valid and hence the descriptions published here.

For the *Broghammerus* taxa described, it is likely that *sensu stricto* many are in fact species, rather than merely subspecies as described here. All are known to be reproductively isolated from one another in the wild state. This was used by Harvey, Barker, Ammerman and Chippendale. (2000) as an important factor in terms of the defining *Australiasis* species in their paper.

However this author has for the present time taken the conservative approach with respect to naming these new taxa.

It is anticipated that most of these taxa will inevitably be elevated to full species status at a later time as more data becomes available.

NOTES ABOUT THE LIST THAT FOLLOWS

Following is a list of all species or subspecies of pythoninae known. It is in alphabetical order.

For some groups and taxa there is a more detailed account in line with the descriptions that form the most important parts of this paper.

As a rule, after each species or subspecies name is a brief indication of the known distribution.

Synonyms as listed in Cogger et. al. (1983), Harvey, Barker, Ammerman and Chippendale. (2000), Kluge (1993) and Romer (1956) are not repeated here. In combination, those lists are believed to be comprehensive. Names used in those papers with reference to given taxa, either as species in their own right or as junior synonyms are all regarded as junior synonyms to the names used here unless otherwise indicated.

Aspidoboa and *Helionomus* are both valid names as per the relevant sections of the ICZN's Code (fourth edition) and are therefore used here even though both are very old and currently little-known.

Below and where appropriate, the nominate subspecies is only indicated by the binomial rather than as a trinomial. Distribution information given in these instances for the nominate form only applies to this subspecies and not all others. The list runs alphabetically and newly described taxa are placed in this list where appropriate.

PYTHONINAE SPECIES AND SUBSPECIES OF THE WORLD

GENUS *ANTARESIA* WELLS AND WELLINGTON 1983

Antaresia childreni (Gray 1842) (N. Australia)

Antaresia maculosus (Peters 1873) (NE Australia along coast and ranges)

Antaresia perthensis (Stull 1932) (Pilbara, West Australia)

Antaresia saxacola Wells and Wellington 1985 (Central Australia)

Antaresia saxacola campbelli Hoser 2000 (SE Inland Australia)

Antaresia saxacola stimsoni (Smith 1985) (Western Australia)

GENUS *ASPIDITES* PETERS 1876

Aspidites melanocephalus (Krefft, 1864) (NE Australia)

Aspidites melanocephalus adelynensis Hoser 2000 (Kimberleys, West Australia)

Aspidites melanocephalus daviei Hoser 2000 (Pilbara, West Australia)

Aspidites ramsayi (Macleay, 1882) (SE inland Australia)

Aspidites ramsayi panoptes Hoser 2000 (SW West Australia)

Aspidites ramsayi richardjonesi Hoser 2000 (NW West Australia)

GENUS *ASPIDOBOA* SAUVAGE 1884

Aspidoboa breitensteini (Steindachner 1880) (Borneo)

Aspidoboa brongersmai (Stull 1938) (Malay Peninsula and Sumatra)

Aspidoboa curtus (Schlegel 1872) (West Sumatra)

GENUS *AUSTRALIASIS* WELLS AND WELLINGTON 1983

Australiasis amethystina (Schneider 1801) (Southern New Guinea)

Australiasis amethystinus clarki (Barbour 1914) (NE Australia)

Australiasis clastolepis (Harvey et. al. 2000) (Mollucan islands, Indonesia)

Australiasis duceboracensis (Gunther 1879) (Bismark Archipelago)

Australiasis nauta (Harvey et. al. 2000) (Tanimbar Islands, Indonesia)

Australiasis timorensis (Peters 1877) (Timor)

Australiasis tracyae (Harvey et. al. 2000) (Halmahera island, Indonesia)

GENUS *BOTHROCHILUS* FITZINGER 1843

Bothrochilus boa (Schlegel 1837) (Bismark Islands, PNG)

GENUS *BROGHAMMERUS* GEN. NOV.

TYPE SPECIES: *BOA RETICULATA* SCHNEIDER 1801

DIAGNOSIS

A group of extremely large pythons from the south-east Asian region.

Up until now, this genus has comprised just one known species, namely the Reticulated Python (*Broghammerus reticulatus*).

It's known distribution is the Indo-Malay archipelago from the small islands just west of the Island of New Guinea west to the Indochina countries of Thailand, Burma, Vietnam and Laos and including the Philippines (see the more detailed listing below). However it appears that several similar taxa have in fact been lumped within this species under the single name "*reticulatus*". The regional variants now known as *Broghammerus reticulatus*, will be further subdivided in the future at least to the subspecies level as has now been done for some of the better-known regional variants (see formal descriptions below).

These snakes are separated from one another by a host of general traits including physical morphology, DNA traits, colour patterns, colours, eye and/or iris colour and so on, as well as distribution on different land masses.

There has not been a detailed analysis of scale-count variation between the regional subspecies and preliminary evidence suggests much overlap in this character between various populations.

Due to the fact that "*reticulatus*" as a whole is listed by the IUCN as "vulnerable" and the increasing rate of harvesting the species for the skin trade and general habitat destruction throughout the relevant region, the conservation status of several regional variants may be precarious and hence the sooner that all regional races are formally delineated, named and properly assessed, the better.

The identification of new subspecies of *Broghammerus reticulatus* in this paper does not purport to be a comprehensive listing of all subspecies. It is anticipated that as more specimens are collected from other parts of the range of *Broghammerus*, including those areas currently subject to civil unrest, further variants will be formally named.

In any event, due to the fact that all the previously used names for the species, namely *Boa reticulata* (Schneider, 1801), *Boa rhombeata* (Schneider, 1801), *Boa phrygia* (1802) and *Python schneideri* (Merrem 1820), and since made synonymous lack anything remotely resembling accurate locality data, save perhaps for Seba (1734), pl. 62, it is clear that all must therefore be taken now to identify the same single race of the species.

Based on the original description of the nominate species and the only remotely accurate location data given, namely: "Orient", Seba (1734), it must be deemed that the typical race of *Broghammerus reticulatus* is that found in the general area of Singapore, mainland south-east Asia, including peninsula Malaysia or immediately adjacent Islands, to which the name "Orient" is usually referred.

This author calls for a neotype to be designated for the species, preferably of the "typical" Malay Peninsula form, such as that found in the general vicinity of Singapore. There are numerous such specimens in Museum Collections.

This is the largish regional race with a brownish head, much the same colour as the lighter dorsal body markings, although light-headed specimens are known and several colour variants and distinct colour mutations are also known.

The only snakes with which this genus (*Broghammerus* gen. nov.) could likely be confused with are those of the genus *Python* which as defined here in this paper only includes the species *molurus*.

They are readily separated by a host of characters including the fact that they usually have four pitted supralabials versus just two in *Python molurus* (and *Helionomus sebae*).

McDowall (1975), pages 50-51 separated *Broghammerus* gen. nov. from all other Afro/Asian Pythons, which he put into the so-called "*molurus* group", with a suite of characteristics that in themselves largely diagnosed the former

genus (*Broghammerus*) at least in as much as separating it from other Afro/Asian python genera *Python*, *Aspidoboa*, *Helionomus* and *Shireenhoserus* gen. nov..

To repeat some of McDowall's information here, this included the fact that the supralabial pits in *Broghammerus* gen. nov. are diagonal slits and less deeply impressed than the square pits of the more posterior infralabials; the infralabial pits are set in a distinct groove, defined ventrally by a longitudinal fold (similar to *Leiopython albertisi*). By contrast in the so-called "*molurus* group" (which included all of genera *Python*, *Aspidoboa*, *Helionomus* and *Shireenhoserus* gen. nov.) the infralabial pits are much more shallow than the supralabial pits and are not set in a groove; the supralabial pits are square or triangular.

The dorsal colouration in *Broghammerus* is also radically different to all other pythons as seen by comparative photos, including those published in Stafford (1986).

In *Broghammerus* the dorsal pattern in wild specimens is virtually always that which gives the markings a reticulated appearance, hence the common name "Reticulated Python". With the possible exception of some *Python molurus* and *Helionomus sebae*, which to an unexperienced person may appear to have a reticulated pattern, no other African or Asian pythons have a dorsal patterning resembling anything like *Broghammerus*.

Broghammerus are different to and readily separated from all *Python*, *Shireenhoserus* and *Helionomus* by the following trait. In *Broghammerus* there is generally a dark mid dorsal line running from the rear to the front of the head and bordered on either side by distinctly lighter scales.

None of the other three genera share this trait. Furthermore there is no line, border or blotch running flat between the eye and the snout along the upper side region of the head as is seen in the three other genera.

A number of breeders have successfully propagated a number of unusual (and often patternless) mutations, which do not necessarily conform to the colour information just given. These are now common in herpetoculture. However these are still easily placed within their given species (and genus) due to the other parameters outlined in this paper.

Broghammerus can be further separated from *Python* and *Helionomus* and *Shireenhoserus* gen. nov. by it's iris colour, being red or orange, versus brownish.

Aspidoboa are readily separated from *Broghammerus* by their smaller adult size and distinctly stout build.

In any event, *Aspidoboa* are separated from all other pythons by the presence of a naso-preocular groove, which is a diagonal division that passes between the large facial scales from the upper posterior of the nasal scale posterior to the lower prefrontals. The groove is bounded above by the prefrontals and upper preocular and below by 1-3 large loreals and the upper margins of the supralabials. The groove itself is scaled with a series of small to granular loreal scales. *Aspidoboa* pythons also have a significantly shorter tail-length to head-length ratio than all other pythons (1.6 for *Aspidoboa*). See Keogh, Barker and Shine (2001) for further details.

In terms of cytochrome *b* mitochondrial DNA sequence data, Keogh, Barker and Shine (2001) found a 10.3% divergence between *Aspidoboa brongersmai* and *Broghammerus reticulatus* in their tests.

The only other pythons remotely likely to be confused with *Broghammerus* are those of the genus *Australiasis*. *Australiasis* species can be separated from *Broghammerus* where they occur more-or-less together (Flores and Timor) by the fact that they are essentially patternless dorsally.

They are also of generally slighter build and smaller adult size.

Other diagnostic information for the genus *Broghammerus* can be readily gleaned from the literature as cited at the end of this paper, or the excellent list of sources specific for *Broghammerus* as cited by Uetz (2002).

The modern day distribution of *Broghammerus* suggests that it is a recently evolved species group that has expanded its distribution within a very short period of time.

This may be due to the fact that *Broghammerus* appears to have crossed (by swimming or rafting) some sizeable water barriers, to almost cross the divide from Asia to Australasia (assuming that it evolved on the Asian side).

However although found on Islands within the Australasian region, *Broghammerus* hasn't yet made it to the Australia/New Guinea mainlands.

Corroboration of this hypothesis comes from the fact that the species is known to have "rafted" or swam to the Island of Krakatoa after life there was extinguished by a volcanic eruption.

However in partial rebuttal of this theory was the findings by Harvey, Barker, Ammerman and Chippendale. (2000) that there was little if any gene flow evident between the main island populations of *Austaliasis*, whose distribution and mobility across bodies of extant water appears to be less, but had previously been assumed to be greater.

These findings indicated that present day distributions of most Australian and Asian pythons may also reflect in large part earlier distributions of land masses at times of lower sea levels.

Based on this most recent finding by Harvey, Barker, Ammerman and Chippendale. (2000) and the fact that the water barriers separating populations of *Broghammerus* are often huge, it seems inevitable that the various major populations of *Broghammerus* will ultimately be recognised as full species rather than as subspecies as indicated here.

However as already indicated, in this paper, the conservative approach has been taken with the known variants merely being named as subspecies.

ETYMOLOGY

The genus is named in honour of German herpetologist Stefan Broghammer for his general contributions to the science of herpetology and in particular his work on python conservation, particularly through his publications on captive breeding of these snakes.

KNOWN MAXIMUM SIZES OF BROGHAMMERUS GEN. NOV.

Measurements as quoted in the literature claiming lengths in excess of 33 feet (10 metres) should be treated with skepticism.

Specimens over 20 feet (more than 6 metres) are seen from time to time.

On the internet site: http://www.bobclark.com/d_learn.asp?id=71&cat=pythons run by Bob Clark is a picture of an adult *Broghammerus*. The text on the site, cited here as Clark (2002), reads as follows:

'Fluffy, the 310lb. reticulated python.

Fluffy may be the largest snake in captivity. She's 12 years old, captive born and tame. She weighs 310lbs, actual weight, and is somewhat over 22' long. She continues to grow at a fairly rapid rate gaining about 40lbs in each of the last two years.'

Taronga Zoo in Sydney, Australia also claimed specimens in excess of 20 feet (more than 6 metres) (Chris Williams, personal communication).

The Pittsburgh Zoo in the United States claimed a speci-

men in the past at 28 feet.

There is little doubt that the longest verified living snake was a *Broghammerus*.

KNOWN DISTRIBUTION OF BROGHAMMERUS GEN. NOV.

According to the internet site at:

<http://www.nature-conservation.or.id/pythonidae.html>

put together by Ed Colijn the distribution for *Broghammerus* is listed as including:

India (including Nicobar Islands north of Sumatra), Bangladesh, Myanmar, Cambodia, Laos, Vietnam, Thailand, Peninsular Malaysia, Singapore, Weh, Simeulue, Babi, Nias, Banyak, Mentawai, Riau, Natuna and Anambas Islands, Sumatra, Enggano, Bangka, Belitung, Krakatau Islands, Kalimantan, Sarawak, Sabah, Brunei, Java, Nusa Barung, Lombok, Sumbawa, Flores, Alor, Pantar, Lombok, Sumba, Timor, Wetar, Leti, Romang, Banda and Tanimbar Islands, Selayar, Kayadi, Tanah Jampea, Sulawesi, Buton, Sula Islands, Bacan, Ternate, Halmahera, Obi, Buru, Seram, Ambon, Boano, Haruku, Saparua and Philippines

This information cited here as Colijn (2002) is believed to be accurate, although obviously many of the islands within this general ambit that have this genus are inadvertently omitted.

Similar information appears in regional herpetology guides (e.g. David and Vogel (1996)) and is reflected in the databases of 26 Museums in North America and several others in Europe and South-east Asia.

BROGHAMMERUS RETICULATUS DALEGIBBONSI SUBSP. NOV.

HOLOTYPE

A specimen at the Field Museum of Natural History, 1400 S. Lake Shore Drive, Chicago, IL 60605-2496. The specimen, number: 142320 is from Ambon Island in the Moluccas in Indonesia, Lat. 3° S, Long. 128° E. It was collected in 1963 by A.M.R. Wegner.

PARATYPE

A specimen at the Field Museum of Natural History, 1400 S. Lake Shore Drive, Chicago, IL 60605-2496. The specimen, number: 142093 is from Ambon Island in the Moluccas in Indonesia, Lat. 3° S, Long. 128° E. It was collected in 1963 by A.M.R. Wegner.

DIAGNOSIS

It appears that this is a generally smaller race of *Broghammerus* than the typical race from further west in South-east Asia. Size and colouration as a trend separate this form from the nominate race *reticulatus*.

Their colouration is also often darker than those from further west. It rarely has a head lighter than the body as in some other variants of *Broghammerus*, such as those from Bali or parts of Thailand (see *Broghammerus reticulatus euanedwardsi* subsp. nov. below). This race generally has a pugnacious disposition in captive settings.

This subspecies is only definitively known from Ambon at this stage, although it is safe to say that the *Broghammerus reticulatus* from nearby Ceram are assignable to this subspecies.

This subspecies is best separated from all other *Broghammerus* by DNA analysis and/or accurate distribution information.

The subspecies co-exists with *Austaliasis clastolepis*.

ETYMOLOGY

Named after Australian herpetologist Dale Gibbons for various contributions to wildlife conservation in the Australian state of Victoria.

BROGHAMMERUS RETICULATUS EUANEDWARDSI SUBSP. NOV.

HOLOTYPE

A specimen at the Field Museum of Natural History, 1400 S. Lake Shore Drive, Chicago, IL 60605-2496. The specimen, number: 180232 is from Nakhon Ratchasima, Central Thailand. Lat. 14° 58' N, Long. 102° 07' E. It was collected on 10 August 1969 by W Ronald Heyer.

PARATYPE

A specimen at the Field Museum of Natural History, 1400 S. Lake Shore Drive, Chicago, IL 60605-2496. The specimen, number: 178660 is from Khorat, Central Thailand. Lat. 14° 58' N, Long. 102° 7' E. It was collected in October 1957.

DIAGNOSIS

This is a large race of *Broghammerus reticulatus*, with specimens known to exceed 6 metres. Although it is touted as a yellow-headed and docile variant, not all specimens of this subspecies have this trait. However as general trends, these factors separate this subspecies from the nominate race.

Specimens are often docile in temperament, especially as adults and make good pets, provided one makes sure that they don't handle them after cleaning out rat or rabbit cages.

This subspecies is known only from parts of Thailand, but probably occurs elsewhere including the westernmost parts of the *Broghammerus reticulatus* range.

It is best separated from other *Broghammerus reticulatus* by either good locality information and/or DNA analysis.

ETYMOLOGY

Named in honour of herpetologist Euan Edwards.

BROGHAMMERUS RETICULATUS HAYDN MACPHEI SUBSP. NOV.

HOLOTYPE

A specimen at the Field Museum of Natural History, 1400 S. Lake Shore Drive, Chicago, IL 60605-2496. The specimen, number: 148968 is from, the Kapit District, Sarawak, (Borneo), Malaysia. It was collected by F. Wayne King on 9 August 1963.

PARATYPE

A specimen at the Field Museum of Natural History, 1400 S. Lake Shore Drive, Chicago, IL 60605-2496. The specimen, number: 67265 is from Sarawak, (Borneo), Malaysia.

It was collected by Tom Harrisson on 16 Jun 1951.

DIAGNOSIS

This is a large race of *Broghammerus reticulatus*, with specimens known to exceed 6 metres. It is restricted to the Island of Borneo, although similar specimens have been seen from parts of Sulawesi and may ultimately be referable to this taxa.

Specimens are often snappy in temperament, even as adults and do not necessarily make good captives.

As a generalization, larger average adult size can be used to separate this subspecies from "normal" *reticulatus*.

Yellow-headed specimens do occur, but are not generally common.

The subspecies has been separated by some people from

other *Broghammerus* by it's iris colour, although this author has failed to find it to be a reliable indicator.

It is best separated from other *Broghammerus reticulatus* by either good locality information and/or DNA analysis.

ETYMOLOGY

Named in honour of Victorian (Australia) herpetologist Hayden McPhie for various contributions to wildlife conservation.

BROGHAMMERUS RETICULATUS NEILSONNEMANI SUBSP. NOV.

HOLOTYPE

A specimen at the Field Museum of Natural History, 1400 S. Lake Shore Drive, Chicago, IL 60605-2496. The specimen, number: 53272 is from Davao Province, Mindanao Island, the Phillipine Islands. Lat. 7°04' N, Long. 125° 40' E. It was collected by Donald Heyneman on 27 September 1946.

PARATYPES

A specimen at the Field Museum of Natural History, 1400 S. Lake Shore Drive, Chicago, IL 60605-2496. The specimen, number: 53281 is from Davao Province, Mindanao Island, the Phillipine Islands. Lat. 7°04' N, Long. 125° 40' E. It was collected by a local Philippine native on 14 January 1947.

A specimen at the Field Museum of Natural History, 1400 S. Lake Shore Drive, Chicago, IL 60605-2496. The specimen, number: 53287 is from Davao Province, Mindanao Island, the Phillipine Islands. Lat. 7°04' N, Long. 125° 40' E. It was collected by a local Philippine native on 24 November 1946.

A specimen at the Field Museum of Natural History, 1400 S. Lake Shore Drive, Chicago, IL 60605-2496. The specimen, number: 53273 is from Davao Province, Mindanao Island, the Phillipine Islands. Lat. 7°04' N, Long. 125° 40' E. It was collected by a local Philippine native on 9 October 1946.

A specimen at the Field Museum of Natural History, 1400 S. Lake Shore Drive, Chicago, IL 60605-2496. The specimen, number: 53283 is from Davao Province, Mindanao Island, the Phillipine Islands. Lat. 7°04' N, Long. 125° 40' E. It was collected by Harry Hoogstraal on 17 January 1947.

DIAGNOSIS

It appears that this is a large and generally aggressive race *Broghammerus*. Quiet and easily tamed specimens are relatively unusual.

It rarely has a head lighter than the body as in some other variants of *Broghammerus*, such as those from Bali or parts of Thailand, although light-headed specimens are known.

This subspecies is only definitively known from Mindanao and adjacent Phillipine Islands this stage and is best separated from all other *Broghammerus* by comparative DNA analysis and/or accurate distribution information.

ETYMOLOGY

Named in honour of the long-term reptile breeder, Neil Sonneman, from Murrumbidgee, in Northern Victoria, Australia.

BROGHAMMERUS RETICULATUS PATRICKCOUPERI SUBSP. NOV.

HOLOTYPE

A specimen at the Museum of Comparative Zoology at Harvard, MCZ number: R-25266. It was collected in 1924 at "Djamplong", South Timor, Lat. 4° S, 125° E. The person who collected the specimen in 1924 was M. Smith.

DIAGNOSIS

This is the only *Broghammerus* found on Timor.

It is a smaller than average race and is of variable temperament.

Broghammerus reticulatus patrickcouperi subsp. nov. is usually a brightly coloured subspecies and this trait alone generally separates the subspecies from "typical" *reticulatus*.

The subspecies is best separated from other *Broghammerus reticulatus* subspecies by DNA properties and/or accurate locality information.

It is a little-known and rarely kept subspecies.

It co-exists on Timor with *Australiasis timorensis*.

ETYMOLOGY

Named after Queensland-based herpetologist Patrick Couper for his contribution to herpetology.

BROGHAMMERUS RETICULATUS STUARTBIGMOREI SUBSP. NOV.

HOLOTYPE

A specimen at the Museum of Comparative Zoology at Harvard, MCZ number: R-8003. It was collected in 1906 from Buitenzore, Java, Indonesia, Lat. 3°4'S, Long. 128°12'E. It was collected by T. Barbour in December 1906.

DIAGNOSIS

This is a subspecies which usually has an exaggerated yellowish hue all over its dorsal surface as compared to other *Broghammerus reticulatus*.

It is of variable size (but generally largish) and within the constraints of being yellowish all over has several distinct colour variations, even in a single group of young.

It is usually (but not always) separated from other *Broghammerus reticulatus* by the following suite of characteristics: white blotches along the sides of the body, a relative lack of head markings on a light brown or yellowish head. The black line seen in most *Broghammerus reticulatus* that usually runs from the temple to the eye, usually fails to reach the eye in this subspecies. They also usually have a relatively light coloured eye.

Broghammerus reticulatus stuartbigmorei is readily distinguished from *Broghammerus reticulatus* from Sumatra and Borneo, indicating that the population has been separated for quite some time.

This same subspecies is believed to occur on the island of Bali.

The subspecies *stuartbigmorei* is best separated from others by distribution and/or DNA properties.

ETYMOLOGY

Named after Stuart Bigmore of Victoria, Australia for his contributions to herpetology over two or more decades, in particular varanid taxonomy.

GENUS *CHONDROPYTHON* MEYER 1874

Chondropython viridis (Schlegel 1872) (Aru Islands, Indonesia)

PREAMBLE TO THE DESCRIPTION OF *CHONDROPYTHON VIRIDIS* *COVACEVICHAE* SUBSP. NOV.

Hoser (2000) did not make any new taxonomic arrangements or name changes for any Green Pythons (*Chondropython viridis*) including Australian specimens, for several reasons including pending further research on this species and sighting of further specimens from both New Guinea, Aru and other Islands and North East Australia.

Since Hoser (2000) was published, this author has been fortunate enough to make cursory and detailed observations of preserved specimens from both New Guinea and Australia held at both the Queensland Museum (QM) and National Museum of Victoria (NMV) as well as numerous live specimens in private collections in Australia.

Furthermore this author has obtained photos and other data for specimens held in captivity outside of Australia.

Notwithstanding this, a major problem for research into this species has been the relative paucity of specimens from within Australia to compare with specimens from elsewhere as well as generally unreliable locality data for many of the specimens seen.

There has also been an increased interest by other herpetologists in terms of separating Australian specimens from those from elsewhere.

This interest has also been shared by the relevant wildlife authorities, in particular the Queensland National Parks and Wildlife Service (QNPWS) who have launched at least one major prosecution against a herpetologist who alleged he had Queensland *C. viridis*, when the QNPWS in turn alleged that his snakes derived from stock smuggled to Australia and of origins outside Queensland.

That case, involving, Queensland snake breeder Bob Buckley has now been resolved. The early stages of that case were covered in detail in the book *Smuggled-2: Wildlife Trafficking, Crime and Corruption in Australia* (Hoser 1996).

It was a reluctance to be drawn into the Buckley case as a witness or to prejudice proceedings and be in "contempt of court" that also made this author decide to postpone formally naming the Australian subspecies of *C. viridis* until after the conclusion of the case.

The Australian subspecies of *C. viridis* formally named and recognised here for the first time has already been recognized by many herpetologists both within Australia and elsewhere as different and this paper merely formalizes that arrangement.

It had originally been hoped to publish a complete revision of the *C. viridis* species group with detailed information on all regional variants, however the scope of this ongoing project is exceptionally large and may take an indeterminate time frame due to the inherent difficulties in this project and other competing time and resource demands, so this partial reclassification of the species group, incorporating Australian specimens only has been published now in this paper.

One of the reasons for the earlier publication of this paper is the ongoing interest by local herpetologists and authorities in maintaining the genetic purity of Australian specimens in captivity in Australia.

A similar situation occurred for the other three Australian taxa formally named in this paper and those descriptions are published for the same reasons. Further data has confirmed their status as distinct from related forms.

GENUS *CHONDROPYTHON* MEYER 1874

This is the Green Python (the common name applied to the snakes of this genus). There is only one species within the genus. That is *Chondropython viridis*.

The type locality is the Aru Islands, Indonesia, south of New Guinea. Some recent workers, including Kluge (1993) and Underwood and Stimson (1990) have made synonymous this genus and *Morelia*, the latter name taking precedence. This author did not accept that arrangement in Hoser (2000) and still does not accept it. While it is clear that the two genera derived from the same ancestral stock, it is believed that the two have been separated long enough to warrant being placed in separate genera.

Furthermore, this author views the placement of *Chondropython* into *Morelia* as an inconsistent move, bearing in mind the widespread splitting off of other similar genera viz *Antaresia* and *Leiopython*, both names of which were in general usage prior to publication of Hoser (2000).

The lack of a distinct dorsal pattern of blotches and stripes that typifies all *Morelia* (except *spilota*) or a black and yellow dorsal pattern as in *spilota* separates *Chondropython* from all snakes in *Morelia*. There are no iridescent green *Morelia*. This is the usual dorsal colouration for adult *Chondropython*. The absence of labial pits in *Chondropython* is frequently cited as a characteristic that separates the genera *Chondropython* and *Morelia*. That is not so. In fact both genera have distinct labial pits. See the photos published on page 118 bottom left for *M. variegata* and page 123 bottom left for *C. viridis* in Barker and Barker (1994), or photos published in Hoser (1989) and O'Shea (1996) to view the labial pits in both genera.

Green Pythons are separated from all *Morelia* by their far greater number of small scales on the dorsal surface of the head, giving the snake an almost granular appearance. Comparative photos of the heads as shown in Barker and Barker (1994) and Hoser (1989) readily illustrate this point.

The Green Pythons are readily distinguished from all other Australian pythons. Refer to Hoser (1981a) McDowall (1975) and O'Shea (1996) for further diagnostic information. Australian Green Pythons (as cited by Thomson (1935)) are more likely than the New Guinea specimens to have markings in a thin line along the spine to form some sort of vertebral line or pattern.

This is corroborated by other authors including the photos in Greer (1997). However the same trait is also seen commonly in south New Guinea and Aru Island specimens and thus the trait cannot be seen to be consistent in terms of identification. Also see the subspecies description below.

Specimens from the north of New Guinea are likely to have spots in a more irregular pattern.

Specimens from around the high country of Wamena in Irian Jaya are often a very dark green with buttercup yellow spots on the back. The dark yellow ventral scales are commonly a grey/black in colour. As with *Morelia*, *Chondropython* is a species with considerable variation in colour, not only between locations, but even within a single location and even within a single litter of young.

Numerous other colour variants are known, including blue adults and "mite phase" which as adults are green with lots of black flecks as well as sometimes having other markings such as scattered white scales. One such animal ("Mite phase") was depicted in a post by Scott (?) on March 24, 2002 at 19:22:14: at: <http://www.kingsnake.com/forum/gtpython/messages/22444.html> on <http://www.kingsnake.com>.

Photos of Australian Green Pythons in life with exact locality data are shown in Barker and Barker (1994) and Greer (1997) and other publications.

Photos of New Guinea Green Pythons in life with exact locality data are shown by O'Shea (1996) and other publications.

CHONDROPYTHON VIRIDIS COVACEVICHAE SUBSP. NOV.

HOLOTYPE

An adult specimen (number D51862) held at the National Museum of Victoria (NMV), from "Cape York, Queensland" (The general Lat. Long. for Cape York is: 15°00' S, 143°00' E). The snake was not accurately measured due to the

fact it was hardened in tight coils, however it was about 1 metre in total length.

Dorsally the snake was dark in colour (relative for the species *C. viridis*) and a generally uninterrupted colour dorsally, save for a thin line of lighter scales along the dorsal vertebra, having been a generally dark green in life.

Ventrally the holotype of *Chondropython viridis covacevichae* sp. nov. was light in colour, (having been a yellow colour in life) and with some dark flecks on some scales (probably grey, black or green flecks in life).

The sex of the holotype of *Chondropython viridis covacevichae* sp. nov. was not ascertained.

There were six pits in the lower labials and three on the upper scales of the mouth, towards the front of the head (these counts being for each side of the head).

The holotype of *Chondropython viridis covacevichae* sp. nov. had 233 ventrals, divided anal and 65 (all paired) subcaudals.

Most of the scales on the dorsal surface of the head were small and almost granular in appearance and somewhat irregular.

The teeth were long and sharp.

The holotype of *Chondropython viridis covacevichae* sp. nov. had been in captivity prior to being lodged at the museum as evidenced by the one or more domestic mice (*Mus musculus*) found inside the stomach of the snake (undigested).

Based on the fact that the snake was collected on 20 June 1973, the age of the specimen certainly predates the period when numbers of the species were smuggled into Australia from the USA and Europe having themselves been sourced from snakes derived from New Guinea/Irian Jaya stock.

DIAGNOSIS

Chondropython viridis covacevichae sp. nov. are the only Green Pythons (*C. viridis*) found on mainland Australia and can be separated from all other *C. viridis* on this basis.

In the absence of good locality data, the subspecies is best separated from other *C. viridis* by comparative DNA analysis, which has already been successfully used to separate this subspecies.

Contrary to statements by many Australian and overseas herpetologists that all Australian *C. viridis* have white or other markings along the vertebra, whereas those from elsewhere do not, claiming this to be diagnostic for Australian specimens of *C. viridis*, this is not the case. Notwithstanding this, it is fair to say that a very thin line or line of dots along the spine is generally a diagnostic trait for adults of this subspecies.

This author has seen *C. viridis* from Australia both with and without such markings (e.g. several captives seen from Cape York which lack very distinctive vertebral markings and those from Iron Range National Park on page 115, top, of Kend (1997) or another specimen from the same area as depicted in Barker and Barker (1994) which have such markings) and likewise for those from New Guinea (e.g. NMV specimens D9747 and D9748 both young specimens from "Uinea" PNG or the juvenile D54438 from Wuroi, PNG, all of which lack vertebral markings and a small adult specimen from PNG at the Queensland Museum (QM J35376) with very thick and distinct white vertebral markings).

As a trend, vertebral markings decline with age. General dorsal markings, sometimes in the form of blotches and mid-dorsal markings are generally far more common in juvenile *C. viridis* of all subspecies.



Raymond Hoser

The range of *C. viridis covacevichae* subsp. nov. is only in very wet habitats of the lowlands and nearby range areas on the east side of Cape York from about the MacMillan River drainage in the north to the area around the Normanby River drainage in the south. This includes the Sir William Thompson and McIlwraith Ranges both in the general vicinity of the Iron Range National Park.

The known distribution of *C. viridis* in Australia is only on very restricted parts of the Cape York Peninsula and does not include the dry savannah habitats that adjoin Torres Strait or the islands within Torres Strait itself.

There is believed to be over 50 km (straight line measurement) between the northernmost *C. viridis covacevichae* subsp. nov. and the northern tip of Cape York, bordering the Torres Strait, which includes generally unsuitable habitat for the subspecies.

In view of the lack of evidence of these snakes inhabiting this area within recent historical or recent prehistorical times, it is reasonable to infer that the Australian *C. viridis* have been separated from other populations for many thousands of years.

Furthermore, in view of the fact that other species of python inhabit these intervening areas and presumably compete with this species in the areas they coexist, it is reasonable to infer that there is not, nor has been any gene flow between the Australian and other populations of this species within recent historical or recent prehistorical times and perhaps as far back as or before Aboriginal settlement of Australia an estimated 40,000 years ago.

The 40,000 year date is significant as it is thought that habitats throughout much of Australia (including the north) may have changed significantly (become generally more open and drier) with the arrival of humans, due to the increased incidence of bushfires. Before the arrival of humans on the Australian continent, habitat may have allowed for gene flow between the Australian *C. viridis* and those populations to the north.

A search of likely habitats in the far north of Cape York and Torres Strait should be undertaken to confirm current distribution data.

CAPTIVE HUSBANDRY

From a keeper's point of view there appears to be no known differences in terms of keeping *C. viridis covacevichae* and *C. viridis* from elsewhere.

These snakes require an enclosure with at least one horizontal tree branch or fork in which to perch and they need a humid environment when sloughing.

Eggs usually take from 38-60 days to hatch (extremes given) (Barker and Barker 1994).

Detailed husbandry information for this species can be found in Barker and Barker (1994), Ross (1978) and Ross and Marzec (1990).

Papers on breeding the species have been published by numerous authors including definitive papers by Murdoch (1999), Rundquist (1993), Walsh (1979) and Zulich (1990). Copies of the papers by Murdoch, Walsh and Zulich are available in full on the internet and can be found using any decent search engine, such as "www.yahoo.com".

ETYMOLOGY

Chondropython viridis covacevichae subsp. nov. is named in honour of Jeanette Covacevich, who was a woman this author didn't know whom he first met in the streets of Adelaide in 1993 when this author accosted her and asked her to take a photo of himself standing with a visiting American herpetologist. As it turns out, she is one of Australia's most respected herpetologists.

GENUS *HELIONOMUS* GRAY 1842

Helionomus sebae (Gmelin 1789) (Africa, mainly Sth of Sahara, excl. Sthn Africa))

Helionomus sebae natalensis (Smith 1840) (Sth Africa and adjacent areas)

GENUS *KATRINUS* HOSER 2000

Katrinus fuscus (Peters 1873) (NE Australia)

Katrinus fuscus cornwallisius (Gunther, 1879) (Southern New Guinea)

Photos: This page and opposite:
Australian Green Python
Chondropython viridis covacevichae subsp. nov. Holotype.

KATRINUS FUSCUS JACKYAE SUBSP. NOV.

HOLOTYPE

A specimen in the Western Australian Museum number 13882 from Kalumburu WA, Lat. 14°18' S, Long 126°39' E. This is a smooth-scaled Python.

PARATYPE

A specimen in the Western Australian Museum number 42796 from Kalumburu WA, Lat. 14°18' S, Long 126°39' E. This is a smooth-scaled Python.

DIAGNOSIS

Katrinus fuscus jackyae is readily identified by the following suite of characters: It is a medium to large python, averaging 2 metres in length, with occasional specimens attaining up to nearly three metres. It is an olive greyish green dorsally with no discernable pattern. Ventrally the snake is usually a bright yellow in colour, visible when the snake is viewed side-on, but this may range from cream or occasionally orangeish. The colour is most intense at the anterior part of the body. The scales are smooth and shiny.

The snakes have large teeth on the premaxilla. The head is covered by large symmetrical shields and there are pits in some of the labial scales. *Katrinus fuscus jackyae*, like others in the genus are separated from *Antaresia* by having a single loreal rather than two or more. *Katrinus fuscus jackyae*, like others in the genus are separated from *Leiopython* by having two pairs of prefrontals as opposed to having a pair. *Katrinus fuscus jackyae*, like others in the genus are separated from *Liasis* by usually having 55 or less mid-body rows (*Liasis* usually has over 60) as well as usually having a more intense colour than *Liasis*.

Katrinus fuscus jackyae and *Liasis olivaceous* are sympatric at the type locality (Kalumburu, WA).



Raymond Hoser



Raymond Hoser

This paper since placed online at: <http://www.smuggled.com/pytrev5.htm>

Katrinus fuscus jackyae is separated from *Katrinus fuscus fuscus* several characteristics including the upper lips.

In *Katrinus fuscus fuscus* (from coastal Queensland) the upper lips are pale with a little brown peppering. However in *K. fuscus jackyae* (from the NT and WA) the lips are usually darker with more dark brown peppering or even blotches.

The two subspecies intergrade in the region of the Gulf of Carpentaria.

This subspecies (*Katrinus fuscus jackyae*) is herein restricted to the region encompassed by the Kimberley Ranges of Western Australia, the Northern Territory and adjacent areas.

The subspecies *Katrinus fuscus fuscus* is herein restricted to the east coast of Queensland and adjacent areas.

The subspecies *Katrinus fuscus cornwallisius* is restricted to the landmass of New Guinea and immediately adjacent islands.

Katrinus fuscus jackyae, like others in the genus are invariably associated with watercourses and are commonly known as 'Water Pythons'. The population at Fogg Dam in the Northern Territory is particularly large and has been well-studied by students and academics at the University of Sydney, under the guidance of Dr. Richard Shine.

Shine and his team of researchers found *Katrinus fuscus jackyae* to be one of the major predators on the river floodplains in northern Australia. They fed mainly on small mammals, in particular native Dusky Rats (*Rathus colletti*), as well as bandicoots, flying foxes, and other vertebrates.

The movements of the snakes did in part correlate with that of their primary food source/s.

In the wild state, the snakes may be either ambush predators or active hunters.

In the Northern Territory mating takes place in June-August, egg-laying (usually 9-16 eggs) in August-September and hatching in November-December.

Nesting occurs in abandoned burrows and among the roots of paperbark trees. For reasons not completely known a large number of clutches are laid in unsuitable places and therefore fail to hatch.

Queensland populations of *Katrinus fuscus fuscus* have a different lifestyle in terms of foods eaten and breeding activity in that mating and egg laying occurs an average 8 or so weeks later than their top-end counterparts.

Anecdotal reports within Australia suggest that Queensland *Katrinus* are more placid (less snappy) than those from the NT and WA.

However this author's experiences suggest that the allegedly snappy nature that these snakes have, is often over-rated. Most individuals may be snappy in cages when they expect food, but usually become reasonably docile when handled. Within this profile, there are some obvious exceptions.

When photographing *Katrinus* (from any location) this author has found the snakes to be placid and after some cajoling, they tend to stay put. The only time they try to snap is usually when the author has forced them to crawl over open areas in order to tire them out, whereupon the snakes may turn and hold their ground (sometimes snapping). This is usually when the snakes are most easily moved to their 'stage' and made to sit in an appropriate photographic position. In captivity these snakes are hardy, breed readily and usually present few husbandry problems.

ETYMOLOGY:

Named after Jacky Hoser, this author's second daughter.

Katrinus mackloti (Dumeril and Bibron 1844)
(Lesser Sunda Islands, Indonesia)

Katrinus mackloti dunni (Stull 1932)
(Wetar, Indonesia)

Katrinus savuensis (Brongersma 1956)
(Sawu Island)

GENUS *LEIOPYTHON* HUBRECHT 1879

Leiopython albertisi (Gray 1842) (Eastern Irian Jaya)

Leiopython albertisi barkeri Hoser 2000 (Mussau, PNG)

Leiopython albertisi bennetti Hoser 2000 (NE PNG)

Leiopython hoserae Hoser 2000 (Southern New Guinea and Southern Irian Jaya)

GENUS *LENHOSERUS* HOSER 2000

Lenhoserus boeleni (Brongersma 1953) (New Guinea and Irian Jaya)

GENUS *LIASIS* GRAY 1840

Liasis olivaceus (Gray 1842) (Nth Australia)

Liasis olivaceus barroni (Smith, 1981) (Pilbara, West Australia)

Liasis papuana (Peters and Doria 1878) (New Guinea and Irian Jaya)

GENUS *MORELIA* GRAY 1842.

Morelia bredli (Gow 1981) (Central Australia)

Morelia carinata (Smith 1981) (Kimberleys North West Australia)

Morelia cheynei Wells and Wellington 1983 (NE Queensland, Australia)

MORELIA EIPPERI SP. NOV.

HOLOTYPE

A specimen at the South Australian Museum (SAM), Adelaide, SA, Specimen number: R1665 from Moolooloo, North Flinders Ranges, South Australia, Lat: 30°59' Long: 138°35'.

PARATYPE

A specimen at the South Australian Museum (SAM), Adelaide, SA, Specimen number: R14261 from Iron Dutchess, Middleback Ranges, South Australia, Lat: 33°15' Long: 137°07'.

DIAGNOSIS

A medium to large python similar in most respects to the others in the genus *Morelia*. It is separated from one of its closest relatives *Morelia rentoni* sp. nov. (see below) by a suite of characteristics including a lower incidence of scale anomalies particularly with regards to ventral scales in the form of longitudinally split ventrals, half ventrals, transversely divided ventrals or incompletely transversely divided ventrals, remnant or partially inserted ventrals or incompletely formed ventrals (such as in two halves).

This species is differentiated from *Morelia rentoni* sp. nov. from St. Francis Island by having more rhomboidal-shaped dorsal scales as opposed to having lanceolate-shaped dorsal scales.

Morelia eipperi sp. nov. is separated from the closely related *Morelia metcalfei* (the Murray/Darling form) by a suite of characteristics including it's dorsal colour pattern.

Morelia eipperi sp. nov. is pale reddish brown dorsally, with broad transverse black-edged patches on the top of the back and a wide pale lateral zone for about a third of its length.

Morelia eipperi sp. nov. is restricted to the Flinders and

Middleback Ranges areas of South Australia. No other *Morelia* occurs here.

Numbers of this species have declined sharply since European settlement, (Ian Renton and Ted Mertens personal communications).

This author hereby calls for specimens of *Morelia eipperii* sp. nov. to be taken into captivity and bred in numbers in order to secure the survival of this taxa.

ETYMOLOGY: Named after Victorian herpetologist Scott Eipper in honour of his services to herpetology. On many occasions he has gone well beyond the call of duty to help fellow reptile-people in need of assistance's.

This author recalls one occasion where Eipper provided free of charge several hundred dollars worth of drugs and related paraphernalia to help a herpetologist he had never previously met to aid a sick python. Eipper refused payment and as a result of Eipper's quick aid, the snake worth several thousand dollars recovered.

There are numerous other examples of similar actions by Eipper.

***Morelia harrisoni* Hoser 2000 (Southern New Guinea and Southern Irian Jaya)**

***Morelia imbricata* (Smith 1981) (South West Australia)**

***Morelia macedowelli* Wells and Wellington 1983 (Eastern Australia, along coast)**

***Morelia metcalfei* Wells and Wellington 1985 (Inland Eastern Australia)**

MORELIA RENTONI SP. NOV.

HOLOTYPE

A specimen at the South Australian Museum (SAM), Adelaide, SA, Specimen number: R13994 from St. Francis Island, in the Nuyts Archipelago near Ceduna in South Australia, Lat: 32°31' Long: 133°18'.

PARATYPE

A specimen at the South Australian Museum (SAM), Adelaide, SA, Specimen number: R19072 from St. Francis Island, in the Nuyts Archipelago near Ceduna in South Australia, Lat: 32°31' Long: 133°18'.

DIAGNOSIS

A medium to large python similar in most respects to the others in the genus *Morelia*. It is separated from its closest relative *Morelia imbricata* by a suite of characteristics including a higher incidence of scale anomalies particularly with regards to ventral scales in the form of longitudinally split ventrals, half ventrals, transversely divided ventrals or incompletely transversely divided ventrals, remnant or partially inserted ventrals or incompletely formed ventrals (such as in two halves).

This species is differentiated from *Morelia* from the South Australian mainland by having lanceolate-shaped dorsal scales as opposed to more rhomboidal-shaped dorsal scales.

This same characteristic also separates *Morelia imbricata* from other southern Australian *Morelia*.

Morelia rentoni sp. nov. is separated from *Morelia imbricata* by distribution (believed to be several hundred kilometers).

While *Morelia rentoni* is highly variable in individual colouration and pattern, the colouration of the species tends to look more like *Morelia* from the South Australian mainland as opposed to *Morelia imbricata*, even though *Morelia rentoni's* dorsal scales are more like those of *M. imbricata*.

This species cannot be definitively separated from other *Morelia* on the basis of scalation alone as these proper-

ties (ventral counts and the like) may overlap with other *Morelia*.

Morelia rentoni sp. nov. is separated from all other *Morelia* by distribution. It is the only species to occur on St. Francis Island.

It is assumed that the total population for this species is less than 1,000 individual specimens, subjected to seasonal variations. At present there are no known threats to the species, but because it is a small island population, it must be regarded as potentially vulnerable, particularly if a feral species becomes established on the Island.

This author hereby calls for specimens of *Morelia rentoni* sp. nov. to be taken into captivity and bred in numbers in order to secure the survival of this taxa.

ETYMOLOGY

Named in honour of South Australian herpetologist Ian Renton for services to herpetology and conservation of wildlife in general, in particular his work in educating school children in formal lectures for many years.

***Morelia spilota* (Lacepede 1804) (Coastal NSW and nearby areas, Australia)**

***Morelia variegata* (Gray 1824) (Northern Australia)**

GENUS NYCTOPHILOPYTHON WELLS AND WELLINGTON 1985

***Nyctophilopha oenpelliensis* (Gow 1977) (Arnhem Land Escarpment, Australia)**

GENUS PYTHON DAUDIN 1803

***Python molurus* (Linnaeus 1758) (Indian sub-continent)**

***Python molurus bivittatus* Kuhl 1820 (Indochina to Indonesia)**

***Python molurus pimbura* Deraniyagala 1945 (Ceylon)**

GENUS SHIREENHOSERUS GEN. NOV.

TYPE SPECIES: PYTHON ANCHIETAE, BOCAGE 1887

DIAGNOSIS

A group of relatively small (under 2 metres) pythons restricted to continental Africa.

They are separated from all other African pythoninae (namely *Helionomus sebae* (Gmelin 1789)) by a vast suite of characteristics that more than adequately separate the two genera.

This includes their smaller adult size (generally well under 2000 mm (with over 1500 mm being unusual) versus an average of 3600-4500 mm in *Helionomus sebae*).

The two genera can also be separated by their totally different dorsal colouration, which is best seen from a perusal of photos of the relevant species, including as seen in Stafford (1986).

In *Helionomus sebae* (Gmelin 1789) the head colouration is characterized by a dark arrowhead blotch on the top, bordered on either side by a pale stripe. This paler stripe which runs through the top of the eye, is more or less straight and continuous and if there is a break, it is well posterior to the eye itself. If the pale arrowhead blotch has a dark separation at the snout it is only relatively narrow.

By contrast in *Shireenhoserus*, there is also a dark dorsal surface of the head bordered by a paler stripe running across the top of the eye. However instead the line gives the appearance of two or more linear blotches that tend to form a line, rather than as a single line as in *Helionomus sebae*.

In *Shireenhoserus* the lighter blotches do not meet at the snout; there is a distinct and wide gap and the gap between the lighter markings on each side is far wider than ever seen in *Helionomus sebae*.

Also in *Shireenhoserus* this line of blotches tends to have a break above the center of the eye, the break often being the topmost supraciliary scale, which is instead the brownish or blackish colour seen on the flat dorsal area of the head. No such break is seen in *Helionomus sebae*.

In *Shireenhoserus* the mid-body scale row count ranges from 53-63, while in *Helionomus sebae* the mid-body row scale count is 71-83. The ventral count for *Shireenhoserus* ranges from 191-267 (versus 265-286 in *Helionomus sebae*). The subcaudal count for *Shireenhoserus* ranges from 28-57 (versus 60-80 in *Helionomus sebae*).

In *Shireenhoserus* the sensory pits are only present on the upper lip for the first 4-5 upper labials, versus just two in *Helionomus sebae*.

For the lower labials, if sensory pits are present in *Shireenhoserus*, they are only very slight, as opposed to the small, but distinct pits on the lower labials in *Helionomus sebae*.

Their breeding biology is also markedly different, the most obvious difference being the number of eggs laid by the female. In *Shireenhoserus* the number of eggs laid is generally well under ten (with a rare record of 11 for *Shireenhoserus regia*, in de Vosjoli, et. al. (1994)); in the genus *Helionomus* the number is generally well above ten. Furthermore the relative size of the eggs laid is proportionately larger in *Shireenhoserus* than *Helionomus sebae*, with egg sizes for all species being similar in spite of the much smaller adult sizes of *Shireenhoserus*.

Shireenhoserus cannot be confused with Asiatic or Australasian pythons, or West African *Calabaria*.

The genus *Shireenhoserus* comprises two known species, namely the Angola Python (*Shireenhoserus anchietae*) which is the type species and the Ball Python (*Shireenhoserus regia*).

These are separated from one another by a whole suite of characters, including of course distribution (refer to Pitman (1974) and other relevant regional texts for details of distribution).

They can also be readily separated by the fact that dorsally between the eyes in *Shireenhoserus anchietae* the scales tend to be small and irregular, while in *Shireenhoserus regia* they tend to be large and distinct shields.

Shireenhoserus anchietae usually has from 263-267 ventrals versus the much lower 191-207 in *Shireenhoserus regia*. *Shireenhoserus anchietae* has 45-57 subcaudals versus the much lower 28-47 seen in *Shireenhoserus regia*.

The two species can also be separated by their markedly different dorsal colour patterns, which can be seen best in comparative photos of the species, including the pair shown on page 47 of Stafford (1996).

Both species typically have a dorsal pattern consisting of alternating dark and light brown patches. However in *regia* the light patches are relatively large and cross-body and give the appearance of having smooth edges.

By contrast in *anchietae*, the light patches are much smaller as in smallish blotches and the edges give a jagged appearance. (Also see Pitman 1974 and other regional texts for further differences between the two species).

Further diagnostic information for the genus *Shireenhoserus* can be readily gleaned from the literature as cited at the end of this paper.

ETYMOLOGY

Named in honour of the author's wife, Shireen Hoser, who coincidentally is a native of Africa, which is where the genus occurs.

***Shireenhoserus regia* (Shaw 1802) (Western sub-Sahara Africa)**

FINAL CONCLUSIONS

It is anticipated that in spite of expected resistance from some quarters, including the campaigns of lies and misinformation likely to be peddled by persons adversely named in this author's corruption exposing texts Hoser (1993), Hoser (1996) and Hoser (2001), the classification adopted in this paper and Hoser (2000) will become widely used in the future as it presents the only viable alternative to the patently untenable lumping of all pythoninae into just three large and badly composed genera as per Underwood and Stimson (1990) and others.

By way of example, Hummell's placement of the species *timorensis* somewhere between *reticulatus* and *amethystina* (as per Hoser (1982) and Hoser (2000)), as a result of his 2001 analysis of sequences for python cytochrome *b* from 17 different species when combined with the results of Harvey, Barker, Ammerman and Chippendale. (2000) vindicates the erection by Wells and Wellington of the genus *Australiasis* to accommodate these species as indicated by Hoser (2000).

By way of further example, Hoser (2000) took the generally unpopular step of making Kluge's genus *Apodora* synonymous with *Liasis*. This was at variance with other recent classifications by other authors (e.g. O'Shea 1996) who had also followed Kluge. However Hummell's 2001 analysis of sequences for python cytochrome *b* from 17 different species, showed:

'The *Apodora (Liasis) paupuana* on the other hand was in a clade with other *Liasis*, namely *Liasis olivacea*, and therefore may not be a distinct genus separate from *Liasis*.'

Hummell made further similar comments indicating his similar views against *Apodora* and raising the possibility that Kluge's results may have in fact been inadvertently flawed.

This is as Hoser (2000) had also found a year earlier, when relying on the obvious morphological and biological data that was widely available and cited in the paper.

Hummell also made the valid point of noting how recent DNA studies had yielded wildly varying results and thought that DNA gathering procedures and within species variance may have been the reason.

Either way, this fact means that the push by some herpetologists to rely solely on DNA analysis based on just a limited number of substances and tests to decide inter-relationships between species and genera should be avoided if this is to mean forsaking more traditional (and to date, generally reliable) methods involving analysis of morphological, biological, behavioral and other traits.

Finally, and with regards to the species and subspecies levels, this paper provides the only recent and consistent approach of the same principals across the whole Pythoninae, and hence the names used here (as those available under the ICZN's code) should be those used in the immediate future, unless and until compelling evidence to the contrary arises.

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Raymond Hoser

Water Python (*Katrinus fuscus fuscus*) - Adult from Cairns, Qld. Australia.

Compare the lack of dark pigmentation on the upper labials of this snake with that seen in *Katrinus fuscus jackyae* (e.g. as depicted in Cogger 1992 p. 607 top).