

A REASSESSMENT OF THE HIGHER TAXONOMY OF THE ELAPIDAE.

RAYMOND T. HOSER

488 Park Road, Park Orchards, Victoria, 3134, Australia.

Phone: +61 3 9812 3322 Fax: 9812 3355 E-mail: viper007@live.com.au

Received 12 February 2012, Accepted 5 March 2012, Published 8 April 2012.

ABSTRACT

This paper reviews recent phylogenetic studies of the elapids to revisit the higher taxonomy of the group, specifically with reference to the level between family and genus.

As a result, the various tribes are redefined, diagnosed and named when there are no pre-existing valid names as determined by the ICZN rules current from year 2000.

Besides utilizing and redefining previously diagnosed tribes, this paper names 20 new tribes and a further 13 new subtribes within the elapidae to present a new classification that better reflects the known phylogeny within the group.

A new family, Homoroselapidae is also erected and diagnosed for African snakes of the genus *Homoroselaps*, as well as a single component tribe.

Keywords: Taxonomy; Nomenclature; snake; elapid; family; tribe; subtribe; genera; genus; phylogeny; Homoroselapidae; Dendroaspini; Elapsoidini; Ophiophagini; Demansiini; Denisonini; Furinini; Hemiaspini; Hulimkini; Hydrelapini; Maticorini; Micropechiini; Notopseudonajini; Oxyuranini; Parapistocalamini; Pseudechini; Pseudonajini; Simoselapini; Sutini; Vermicellini; Acanthophiina; Aspidomorphina; Ephalophina; Hemachatusina; Hoplocephalina; Hydrophiina; Loveridgelapina; Micropechiina; Najina; Notechiina; Parahydrophina; Pelamiina; Toxicocalamina; Homoroselapidini; *Homoroselaps*.

INTRODUCTION

In the period 1975 to present (2012), there have been a large number of studies published in relation to the phylogeny of the extant (living) elapid snakes.

These published studies include the data and findings of Kelly et. al. 2009, Keogh (1999), Pyron et. al. (2010), Wallach (1985), and others (including those cited within).

Within many of the papers published, authors have also ventured their own views in terms of the taxonomy within the group, including for example Cogger (1975, et. seq.), Cogger, et. al. (1983), Slowinski, et. al. (2001), Slowinski, Keogh, Shine and Donnellan (1998), Knight and Rooney (1997), Smith, et. al. (1977), Wells and Wellington (1983 and 1985), (as well as those papers cited within).

Ecological studies, like that of Sine and Keogh (1996) have provided alternative means by which to deduce relationships between elapid genera.

Some authors, in particular Wells and Wellington and later Wells (alone) have tended to split larger genera into ever greater numbers of smaller ones; see for example, Wells (2002) in terms of elapid genus *Pseudonaja*, or most recently Wells (2012) for skink genus *Lerista*.

While there is usually a strong reluctance of others to accept such classifications, the fact remains that over time, a sizeable proportion of these generic level splits are accepted by most publishing herpetologists and so the new names move into general usage.

As a result, there is an ever increasing number of genera which often identify an ever increasing number of species.

One only needs to look at the output of journals such as *Zootaxa*, or the more wide-ranging *Zoological Record* to get an indication of the rate at which new genera and species are being formally named on an annual basis.

Modern molecular methods have shown that snakes in particular are conservative in body design, with seemingly similar species often being distantly related.

This relationships have become better understood with the advent of various new diagnostic methods and techniques.

While taxonomists over the last 20 years have been efficient at diagnosing species and to a lesser extent dividing genera into groups of similar species, the mid-level taxonomy and nomenclature of the elapids in particular seems to have been overlooked, even though the relationships between species groups themselves have now been resolved for the majority.

As genera become more finely defined, as do species, there has been a shift "downward" leaving an ever-increasing gap between the family and genus level.

While genus groups are often defined as such, or alternatively as clades, these are not actual terms of use in the current Zoological code.

Within the level between genus and family, is the relatively under-used level of "tribe".

In 1977, Smith, et. al, presented "A Summary of Snake Classification (Reptilia, Serpentes)", which defined all extant groups of snakes down to tribe level.

In the main he used pre-existing names that had been appropriately used under the code.

For the elapids (and others) he named a number of tribes under the heading "(new name)", for various genera, but did not define these groups in any way.

Smith referred to a work by McDowell "in prep" which one presumes was to properly define the tribes he tentatively named in accordance with the Zoological code of the time in what was in effect a very brief summary.

McDowell published a paper in 1987, (McDowell 1987) but in that failed to define the elapid tribes. In an earlier paper McDowell had referred to the groups of elapids as groups or series.

Other authors (such as Mengden 1983) have referred to the tribes named in Smith et. al. 1977 as "presumed" because they were never actually named or defined and diagnosed in words or characters according to the ICZN code of the time and hence were still *nomen nudem*.

While many of the tribe names used by Smith et. al. are used herein, the ones he first used are herein defined as new (.nov) as they have never previously been defined according to the code and were therefore to this point in time *nomen nudem*.

THE ACTUAL FINDINGS AND PLACEMENT OF GROUPS

Relying on the data of Wallach (1985), Pryon et. al. (2010) and other similar studies since that have had findings more-or-less in line with these papers, the number of elapid tribes is expanded both for Australian and non-Australian elapids, (including sea snakes), the latter of which have been subject of interest by a number of authors, including for example Lukoschek and Keogh (2006), Rasmussen, et. al. (2011) and Wells (2007), although I do not necessarily adopt the exact classifications used therein.

In terms of non-Laticaudid sea snakes, the classification herein reflects the currently accepted phylogeny of the group, in that their origins fit within the Australasian elapid radiation and so they are not treated as a subfamily as had been done by a number of other authors. However each major genus group is treated as a tribe.

For the Laticaudid sea snakes, the subfamilial classification is

retained.

It should be noted however that if it is indeed later found that the Laticaudid snakes have in fact relatively recently derived from one of the other subfamilial elapid stocks, then it may be better to not recognise the subfamily and instead subsume it within another and continue to use the tribe level as applied herein.

By and large what is shown here in this paper is a conservative and consensus position that sits broadly within the middle position of other recent authors.

I have used the results of Slowinski, Knight and Rooney (1997) to erect and define tribes for several groups within the subfamily Bungarinae, although contrary to their evidence I have retained use of the subfamily Elapinae Boie 1827, pending further evidence to support those author's conclusions.

In any event, the ultimate merging of Elapinae and Bungarinae (into a single Elapinae) would not have any effect on the use of the tribe levels defined in the list that follows.

It is noted herein that Wells (2007) has sought to place Australasian elapids within their own subfamily, namely Oxyuranidae, presumably on the basis that links between this clade and the Afro-Asian-American elapids is too distant to warrant both groups being placed in a single family. His currently "outsider" view may in the fullness of time become the consensus position, but is not adopted here as a reflection of the prevailing view of most other authors.

Of note is that the placement of the terrestrial Melanesian elapids has been difficult due to the conflicting evidence of various recent publications.

Parapistocalamus has been placed in a tribe of it's own (Parapistocalamini Tribe Nov.), while recognising that it is probably closely related to the other snakes placed in the tribe Maticorni Tribe nov. (including genera *Calliophis*, *Hemibungarus*, *Maticora*, *Sinomicrurus*).

As a result, this paper presents for the first time a comprehensive diagnosis and classification for the extant (living) elapids, down to tribe (or subtribe) level, with each tribe being defined in accordance with the current ICZN rules (Ride 1999).

In the case of the tribes or subtribes containing several genera, they have been named in accordance with the recommendations of the ICZN code. Noting that in the majority of cases, relevant genera are well-known, the newly named tribes or subtribes have been assigned names on the basis of the genus containing the largest number of recognised species or what I have determined to be the best known genus in the tribe.

The diagnosis of each tribe (or subtribe) should also be read in conjunction with those for the other identified tribes (or subtribes) herein in order to further separate component genera and species from one another.

Names of tribes have been determined according to the relevant sections of the code including, articles 29.2, 35.1, and 62 and any corrections or changes made to earlier authors works where information was either not given or ambiguous, is made according to the code as "first reviser".

In terms of listing component genera within families, subfamilies, tribes, subtribes, I have used the names of recognised genera as accepted by most recently published authors.

In some cases, where genera have been either recently erected or elevated from synonymy of better known genera, I have used these names where I believe the placements are either generally accepted, or likely to become so on the basis of recently published evidence in terms of the relationships of the relevant species.

Some genus names in use for given species, regarded as synonyms of other better-known ones (with different type species) have not been adopted and used here pending further resolution of the evidence one way or other by other authors. Non-use of those names, should not be taken here as a

wholesale rejection of them in terms of factual basis or merit. Rather the use of the chosen genus names herein is for the purpose of accurately clarifying the component groups within each formally named tribe and to remove any ambiguity.

African coral snakes or Harlequin Snakes (*Homoroselaps*) have at times in the past been placed within the family elapidae.

Some authors have placed them within other families and in my view they should be placed in a family of their own, due to their clearly basal origin to other previously defined families or subfamilies (see for example the results of Pyron et. al. 2010).

While non-elapids are generally beyond the scope of this paper and the listing as published herein, it is appropriate that *Homoroselaps* is dealt with properly herein.

Homoroselaps is therefore herein placed within its own Family, Homoroselapidae Fam. Nov. as explained and defined herein according to the current Zoological code.

Recent papers, including those cited at the rear of this paper, have indicated that these snakes are thought to represent primitive basal elapid stock with affinities to Colubridae, Atractaspidinae (in particular) and Elapidae.

In terms of the Atractaspidinae, they are understudied group and two species (*Atractaspis microlepidota* Günther, 1866 and the closely related *A. andersonii* Boulenger, 1905 (long regarded as a subspecies of the former) have been identified by myself as quite divergent from all others and have been placed in a newly erected genus by myself in another paper (see Hoser 2012a).

But in spite of the above view, Kelly et. al. 2004 and other more recent studies have failed to provide convincing evidence to place *Homoroselaps* within either the Elapidae or Atractaspidinae.

As it is not regarded as being tenable to merge Atractaspidinae with Elapidae (at the family level) based on general recognitions and definitions of each group and it is not tenable to safely place *Homoroselaps* within either as it sits basal to them, or at least the Atractaspidinae, it is herein placed within its own new family.

The family Homoroselapidae Fam. Nov. is diagnosed below (after the elapids listed here).

For completeness a tribe named Homoroselapini Tribe Nov. is also diagnosed herein, even though as it stands here it is monotypic for the genus *Homoroselaps*.

In the event that later workers seek to transfer *Homoroselaps* to another family grouping, the tribe will remain to separate it from all other (clearly dissimilar) genera that should as a matter of course be placed in other tribes.

Sea snakes are generically defined within this paper as elapid taxa with a paddle-shaped tail.

FAMILY ELAPIDAE BOIE, 1827

Diagnosis: Elapidae are a family of venomous snakes found globally on all major continental masses and nearby islands, except those permanently ice-bound or (historically) recently so, but they most numerous in terms of species diversity in Australasia, Asia, Africa, and the middle Americas. Water-dwelling and marine species are found in the Indian/Pacific Oceans and regions joining the them.

Known as Proteroglyphs (Proteroglypha Jan 1857), they are characterized by hollow, fixed fangs at the front of the mouth through which they inject venom. This separates them from other kinds of venomous snakes which either have fangs at the rear of the mouth (as seen in some members of the composite (as recognised) family Colubridae) or the Solenoglyphs (Solenoglypha Jan 1857), which have movable fangs situated at the front of the mouth (the snakes of the family Viperidae).

McDowell (1970) split the elapid snakes into two main groups, based on based on the morphology and inferred movements of their palatine bone during prey transport (swallowing).

In the group he called the "palatine erectors", the palato-

pterygoid joint flexes ventrally during upper jaw protraction.

By contrast in the group he called the "palatine draggers" the palato-ptyergoid joint flexes laterally with maxillary rotation when the mouth opens and the jaw apparatus is protracted and slightly ventrally during mouth closing.

In draggers, the anterior end of the palatine also projects rostrally during protraction, unlike the stability of the anterior end seen in erectors. Palatine draggers differ from palatine erectors in four structural features of the palatine and its relationships to surrounding elements (Deufel and Cundall 2010).

Palatine draggers include all Australasian elapids and sea snakes, including hydrophiines, with the exception of the monotypic *Parapistocalamus hedigeri* from Bougainville island New Guinea.

Palatine erectors includes all elapids from Africa, continental Eurasia and the Americas as well as *Parapistocalamus*.

McDowell's split of the elapids into the above two groups has been strongly supported by molecular and other data from other authors.

Subfamily Bungarinae Eichwald, 1831 (Cobras)

Diagnosis: Separated from all other "palatine erectors" elapids by the fact that the body is not slender and cylindrical, with a cylindrical and relatively small and short tail, although in terms of this trait, it is variable, but never long in other palatine erectors.

Content: See within each tribe.

Tribe Bungarini Eichwald, 1831 (Asiatic Cobras)

(Terminal Taxon: *Bungarus candidus*)

Diagnosis: Separated from all other "palatine erectors" elapids by the following suite of characters: Large and highly venomous snakes, known generally as "Kraits", they are covered in smooth glossy scales that are arranged in bold striped patterns of alternating dark and light-colored areas, or a similar configuration of coloured stripes or blotches; the scales along the mid-dorsal line of the back are enlarged and hexagonal; the head is relatively slender and the eyes have round pupils although this is usually hard to determine in life due to the colour of the eye; distinctive of these snakes is the pronounced dorso-lateral flattening with an often highly triangular cross section; the tail tapers to a thin point; 7 supralabials, with numbers 3-4 or 3-5 in contact with the eye, the frontal shield is either as broad as is long, or longer than wide, 200-230 ventrals, single anal and 40-54 subcaudals, anterior single, posterior divided.

These snakes don't have the ability to flare their neck to create a "Hood" as seen in tribes Najini or Ophiophagini Tribe nov..

Egg-layers, restricted to the Indian Subcontinent and south-east Asia.

Content: *Bungarus* Daudin 1803.

Tribe Dendroaspini Tribe nov.

(Terminal Taxon: *Dendroaspis polylepis*)

Diagnosis: Separated from all other "palatine erectors" elapids by the following suite of characters: Scales smooth and glossy with 17-25 mid-body rows, 200-281 ventrals, divided anal and 99-132 divided subcaudals. 7-10 supralabials, the third or fourth entering the eye, 9-14 infralabials, 3-4 preoculars and 2-5 (usually 3 or 4) postoculars, temporals are usually variable but usually 2+3; easily separated from all other elapids in the "palatine erectors" by the distinctive elongate coffin-shaped head, defined by the ridge running from the upper nostril above the eye to the temple; has a limited ability to flatten its neck (hood) when agitated or alarmed.

Commonly known as the Mambas these snakes are dangerously venomous.

Adults of over 2 metres in total length are common and specimens over 4 metres are known for the largest species, the Black Mamba (*D. polylepis*).

While of gracile appearance, large specimens do become quite

heavy due to the weight of the mid-section. Strongly diurnal with a round pupil.

Oviparous with clutches of 16-17 eggs reported.

Found in Africa.

Monotypic for the genus *Dendroaspis* Schlegel 1848.

Content: *Dendroaspis* Schlegel 1848.

Tribe Elapsoidini Tribe nov.

(Terminal Taxon: *Elapsoidea sunderwallii*)

Diagnosis: Separated from all other "palatine erectors" elapids by the following suite of characters: Small to medium-sized burrowing elapids with a noticeably small head relative to the body, and just 13 (rarely 15) mid-body rows, 130-180 ventrals, single anal plate and usually paired subcaudals (some rarely single); 7 supralabials with the third and fourth entering the eye; 7 infralabials, 1-2 preoculars and 2 postoculars; scales are smooth and glossy and the snakes are often of bright colours and patterns, usually in the form of cross-bands; these snakes do not spread a hood when agitated.

Endemic to sub-saharan Africa, these snakes are known as African Garter Snakes.

Egg layers.

Content: *Elapsoidea* Bocage 1866.

Tribe Najini Bonaparte, 1838 (Afroasian Cobras)

(Terminal Taxon: *Naja naja*)

Diagnosis: Separated from all other "palatine erectors" elapids by the following suite of characters: Generally large and stocky snakes that as a rule actively forage and seek prey, when threatened they can raise their forebody and spread a characteristic hood known generally as the "Cobra hood", created by an expansion of the ribs and done to a degree far in excess of all other tribes (excluding Ophiophagini Tribe nov.) as well as an ability to maintain an upright or near upright stance from anywhere between a third to half way down the body (and sometimes even more); single anal plate and all subcaudals are paired; with the exception of genus *Hemachatus*, for all species, scales are smooth and glossy, there are solid teeth on the maxilla, and all are egg-layers; for genus *Hemachatus* the scales are heavily keeled, there are no solid teeth on the maxilla and all are live-bearers.

Separated from Asiatic King Cobras (Ophiophagini Tribe nov.) by the fact that in Ophiophagini Tribe nov. the hood is of even width along the length of the anterior part of the snake's body, as opposed to wide at the back of the neck and narrowing as one moves posterior down the body as seen in Najini snakes. The hood in Ophiophagini Tribe nov. is also proportionately longer and yet proportionately narrower than that seen in snakes of tribe Najina.

Found in Africa (mainly) and also Asia. Miocene fossil records from Europe.

Content: *Aspidelaps* Fitzinger 1843, *Boulengerina* Dollo 1886, *Hemachatus* Fleming 1822, *Naja* Laurenti 1768, *Pseudohaje* Günther 1858, *Spracklandus* Hoser 2009, *Uraeus* Wagler 1830, *Walterinnesia* Lataste 1887.

Subtribe Najina Subtribe nov.

(Terminal Taxon: *Naja naja*)

Diagnosis: Separated from all other "palatine erectors" elapids by the following suite of characters: Generally large and stocky snakes that as a rule actively forage and seek prey, when threatened they can raise their forebody and spread a characteristic hood known generally as the "Cobra hood", created by an expansion of the ribs and done to a degree far in excess of all other tribes (excluding Ophiophagini Tribe nov.) as well as an ability to maintain an upright or near upright stance from anywhere between a third to half way down the body (and sometimes even more); single anal plate and all subcaudals are

paired; for all species, scales are smooth and glossy, there are solid teeth on the maxilla, and all are egg-layers. Separated from the genus *Hemachatus* (Hemachatusina Tribe nov.) by that fact in *Hemachatus*, the scales are heavily keeled, there are no solid teeth on the maxilla and all are live-bearers.

Separated from Asiatic King Cobras (Ophiophagini Tribe nov.) by the fact that in Ophiophagini Tribe nov. the hood is of even width along the length of the anterior part of the snake's body, as opposed to wide at the back of the neck and narrowing as one moves posterior down the body as seen in Najini snakes. The hood in Ophiophagini Tribe nov. is also proportionately longer and yet proportionately narrower than that seen in snakes of tribe Najina.

Found in Africa (mainly) and also Asia. Miocene fossil records from Europe.

Content: *Aspidelaps* Fitzinger 1843, *Boulengerina* Dollo 1886, *Naja* Laurenti 1768, *Pseudohaje* Günther 1858, *Spracklandus* Hoser 2009, *Uraeus* Wagler 1830, *Walterinnesia* Lataste 1887.

Subtribe Hemachatusina Subtribe nov.

(Terminal Taxon: *Hemachatus Heamachatus*)

Diagnosis: Separated from all other "palatine erectors" elapids by the following suite of characters: Generally large and stocky snakes that as a rule actively forage and seek prey, when threatened they can raise their forebody and spread a characteristic hood known generally as the "Cobra hood", created by an expansion of the ribs and done to a degree far in excess of all other tribes (excluding Ophiophagini Tribe nov.) as well as an ability to maintain an upright or near upright stance from anywhere between a third to half way down the body (and sometimes even more); single anal plate and all subcaudals are paired; for all species the dorsal scales are heavily keeled, there are no solid teeth on the maxilla and all are live-bearers; this contrasts with all others in the tribe Najini (subtribe Najina subtribe nov.) where for all species, scales are smooth and glossy, there are solid teeth on the maxilla, and all are egg-layers; separated from Asiatic King Cobras (Ophiophagini Tribe nov.) by the fact that in Ophiophagini Tribe nov. the hood is of even width along the length of the anterior part of the snake's body, as opposed to wide at the back of the neck and narrowing as one moves posterior down the body as seen in Najini snakes; the hood in Ophiophagini Tribe nov. is also proportionately longer and yet proportionately narrower than that seen in snakes of tribe Najina.

Common name is Rhinkal and is endemic to southern Africa.

Content: *Hemachatus* Fleming 1822

Ophiophagini Tribe nov.

(Terminal Taxon: *Ophiophagus hannah*)

Diagnosis: Separated from all other "palatine erectors" elapids by the following suite of characters: Body proportionate to length, head is wider than neck, in addition to other head shields, these snakes possess a pair of occipital shields just posterior to the parietals on the upper surface of the head; 7 supralabials with the third in contact with both the nasal scale and the eye; Scales smooth with 15 mid body rows, 240-254 ventrals, 84-104 subcaudals, all divided except for the first 5-7 anterior ones; colour is both geographically variable and also changes with age; oviparous; in Asiatic King Cobras (Ophiophagini Tribe nov.) the hood is of even width along the length of the anterior part of the snake's body, as opposed to wide at the back of the neck and narrowing as one moves posterior down the body as seen in tribe Najini snakes; the hood in Ophiophagini Tribe nov. is also proportionately longer and yet proportionately narrower than that seen in snakes of tribe Najina.

These snakes, known as "King Cobra" are the largest elapids in the world, averaging 3-4 metres and reputedly attaining over 5 metres. Restricted to southern Asia.

The genus name *Ophiophagus* refers to this taxon's habits of feeding on other snakes.

As of 2012 most authorities regard *Ophiophagus* as a monotypic genus. However it is my considered view that several species are involved.

Content: *Ophiophagus* Günther 1864.

Subfamily Elapinae Boie, 1827 (Coral Snakes)

Diagnosis: Separated from all other "palatine erectors" elapids by the following suite of characters: Slender and cylindrical body; oviparous, 13-17 mid-body rows; unable to flare the neck into a hood.

Content: *Calliophis* Gray 1834, *Hemibungarus* Peters 1862, *Leptomicrurus* Schmidt 1937, *Maticora* Gray 1834, *Micruroides* Schmidt 1928, *Micrurus* Wagler 1824, *Parapistocalamus* Roux 1934, *Sinomicrurus* Slowinski *et al.*, 2001.

Tribe Elapini Boie, 1827 (North American-North Asiatic Coral Snakes)

(Terminal Taxon: *Micrurus spixii*)

Diagnosis: Separated from all other tribes in the subfamily elapinae by elimination of the two tribes Maticorini tribe nov. and Parapistocalamini Tribe Nov. as diagnosed below; but most easily separated by the fact they have 15-17 mid body rows versus 13-15 mid body rows in tribes Maticorini Tribe Nov. and Parapistocalamini Tribe Nov..

Oviparous, with small eyes and round pupils, two or four pairs of chinshields in all snakes, 159-382 ventrals and 12-62 subcaudals; most have the third or fourth supralabials in contact with the eye; most have a colour pattern of some combination of red, yellow or white and black, usually in rings; usually a pale parietal or occipital ring is followed by a black nuchal ring.

The genus *Micrurus* as generally recognised as of start 2012 is clearly paraphyletic (refer to Campbell and Lamar (2004).

As a result, in a separate paper (published at the same time as this one), a new genus *Hoserelapidea* gen. nov. has been erected and diagnosed. Within that genus, subgenera *Binghamus* and *Troianous* have also been erected and diagnosed.

Content: *Leptomicrurus* Schmidt 1937, *Micruroides* Schmidt 1928, *Micrurus* Wagler 1824, *Hoserelapidea* gen. nov. (see paper by Hoser 2012b).

Tribe Maticorini Tribe Nov. (South Asiatic Coral Snakes)

(Terminal Taxon: *Calliophis intestinalis*)

Diagnosis: Separated from all other "palatine erectors" elapids by the following suite of characters: round pupil, shiny smooth scales, usually with bright markings or colour, including often with a bright mid-vertebral stripe and bright coloured posterior including the tail, flash colours on the venter in the form of well-defined alternating bands or blotches, slightly flattened head and somewhat cylindrical body, divided anal, 13 mid-body rows, single anal, 190-280 ventrals, 15-40 divided subcaudals, no loreal; venom gland apparatus apparently breaches the back of the head to run into the neck.

Oviparous.

Content: *Calliophis* Gray 1834, *Hemibungarus* Peters 1862, *Maticora* Gray 1834, *Sinomicrurus* Slowinski *et al.*, 2001.

Tribe Parapistocalamini Tribe Nov.

(Terminal Taxon: *Parapistocalamus hedigeri*)

Diagnosis: Separated from all other Australasian and Papuan elapids (subfamily Hydrophiinae) by the presence of a maxillary diastema (toothless gap) behind the fangs. Separated from all others in the subfamilies Elapinae and Bungainae by the following suite of characters: Small (under 60 cm total length, with a head slightly distinct from the neck, small eye and round pupil; while the head and body are a unicolour brownish a thick light cross-band may be present on the rear of the head or neck,

most commonly only including the parietals (dorsally) and other scales laterally, both lip and lowest dorsal scales are lighter, ventrally yellow or light brown, while the tail is similar or suffused with grey; scalation is smooth and glossy with 15 mid-body rows, 159-169 ventrals, single or divided anal, 32-35 paired subcaudals, no loreals or suboculars, usually 6 supralabials with the third and fourth in contact with the eye, no preocular, or if present either in contact with the nasal scale or prevented from contact by a downward process of the prefrontal and a single postocular.

Known only from Bougainville with one species *P. hedigeri* formally described and recognised.

Content: *Parapistocalamus* Roux 1934.

Subfamily Hydrophiinae Werner, 1890 (Palatine draggers)

Diagnosis: McDowell (1970) split the elapid snakes into two main groups, based on based on the morphology and inferred movements of their palatine bone during prey transport (swallowing).

In the group he called the "palatine erectors", the palatopterygoid joint flexes ventrally during upper jaw protraction.

By contrast in the group he called the "palatine draggers" the palatopterygoid joint flexes laterally with maxillary rotation when the mouth opens and the jaw apparatus is protracted and slightly ventrally during mouth closing.

In draggers, the anterior end of the palatine also projects rostrally during protraction, unlike the stability of the anterior end seen in erectors. Palatine draggers differ from palatine erectors in four structural features of the palatine and its relationships to surrounding elements (Deufel and Cundall 2010).

Palatine draggers include all Australasian elapids and sea snakes (this subfamily), with the exception of the monotypic *Parapistocalamus hedigeri* from Bougainville Island (north of New Guinea) which is within the subfamily Elapinae as defined within this paper.

Palatine erectors includes all elapids from Africa, continental Eurasia and the Americas as well as *Parapistocalamus*.

Content: See lists for each tribe.

Tribe Acanthophiini Dowling, 1967

(Terminal Taxon: *Acanthophis antarcticus*)

Diagnosis: Live bearing, medically significant elapids, with adults ranging from dangerous to highly dangerous to humans.

These snakes are separated from all other land-dwelling (non-sea snake) elapids by either of the following: 1/ The presence of a soft spine on the end of the tail and subocular scales (genus *Acanthophis*). 2/ Single subcaudals and heavily keeled scales (*Tropidechis*), or single subcaudals, more-or-less smooth scales, single anal plate, 13-21 mid-body rows, ventrals either keeled or unkeeled and the lateral scales adjoining the ventrals are noticeably enlarged.

Content: *Acanthophis* Daudin 1803, *Austrelaps* Worrell 1963, *Echiopsis* Fitzinger 1843, *Hoplocephalus* Wagler 1830, *Notechis* Boulenger 1896, *Tropidechis* Gunther 1863.

Subtribe Acanthophiina Subtribe nov.

(Terminal Taxon: *Acanthophis antarcticus*)

Diagnosis: The only Australian elapid snake which possesses a then rat-like tail that ends in a soft spine. It is also the only Australian elapid with subocular scales.

The tail, which often ends in a block of scales one colour (such as black, white or yellow) is used as a caudal lure.

All are stout in build, with a flattened head, these snakes usually having an ambush predator feeding strategy. Large fangs.

While most have at least some slightly keeled scales, the various species range from smooth-bodied snakes to highly rugose.

19-23 mid body rows, 100-160 ventrals (most species around 120-122), 35-65 subcaudals of which the anterior are single and posterior divided.

In habit, these snakes typically rest in a horse-shoe position or similar with the tail resting near the head.

Separated from other Australian elapids by the characters described for the tribe Acanthophiini.

Content: *Acanthophis* Daudin 1803.

Subtribe Hoplocephalina Subtribe nov.

(Terminal Taxon: *Hoplocephalus bungaroides*)

Diagnosis: Separated from all others in the tribe Acanthophiini by the strongly keeled or notched ventrals. Also has 19-21 mid body rows and more than 190 ventrals (versus well below 190 ventrals in all others in the tribe).

Separated from other Australian elapids by the characters described for the tribe Acanthophiini.

Content: *Hoplocephalus* Wagler 1830.

Subtribe Notechiina Subtribe nov.

(Terminal Taxon: *Notechis scutatus*)

All subcaudals single.

Separated from Hoplocephalina by having less than 190 ventrals and unkeeled ventrals.

Separated from Acanthophiina by having no divided subcaudals or soft tail spine.

Separated from other Australian elapids by the characters described for the tribe Acanthophiini.

Content: *Austrelaps* Worrell 1963, *Echiopsis* Fitzinger 1843, *Notechis* Boulenger 1896, *Tropidechis* Gunther 1863.

Tribe Aipysurini Tribe nov.

(Terminal taxon: *Aipysurus laevis*)

Diagnosis: In common with all sea snakes, they are identified by the presence of a vertically flattened, paddle-shaped tail, valvular nostrils and a lingual fossa (which is a depressed area that may appear on the lingual surface of selected anterior teeth).

These are moderate to large sea snakes, known mainly from the Australian region, including New Guinea and the Coral Sea east to New Caledonia.

Separated from all other sea snakes by the following suite of characters; large ventral scales, each at least three times as large as the adjacent body scales, nasals in contact, six or more supralabials, posterior chin shields are usually reduced and separated by one or more small scales and a preocular scale is present, 120-195 ventrals.

Alternatively, (in the case of *Emydocephalus*), the genus is separated from all other sea snakes by the possession of only three supralabials, the second being very elongated and below the eye.

The tribe contains the following described genera, *Aipysurus* (including other sometimes recognised genera *Oceanus*, *Pelagophis*, *Smithohydrophis*, *Stephanohydra*, *Tomogaster*), and *Emydocephalus*.

Content: *Aipysurus* Lacépède 1804, (including other sometimes recognised genera *Oceanus* Wells 2007, *Pelagophis* Peters and Doria 1878, *Smithohydrophis* Kharin 1981, *Stephanohydra* Tschudi 1837, *Tomogaster* Gray 1849), *Emydocephalus* Krefft 1869.

Tribe Apistocalamini Dowling, 1967

(Terminal taxon: *Ogmodon vitianus*)

Diagnosis: A small snake of medium build, with an elongate head and rounded snout.

The tail is relatively short.

Very large symmetrical head shields, including two extremely

large parietals not seen in any other elapids. Juveniles have a white crown running across the posterior two thirds of the parietals which fades with age. The colouration is normally shiny.

Juveniles are also darker than adults, almost black compared with a smokey-grey. Lays a small number of eggs (2-5 reported).

The venom toxicity is unknown, but not thought medically significant.

Content: *Ogmodon* Peters 1864.

Tribe Demansiini Tribe nov.

(Terminal Taxon: *Demansia psammophis*)

Diagnosis: Separated from all other Australasian land dwelling (non-sea snake) elapids by the following suite of characters.

Adults have an eye that has a diameter far greater than its distance from the mouth (jaw-line), smooth scales, 15 mid-body rows, nasal and pre-ocular scales in contact, 35 or more all divided subcaudals, divided anal, no suboculars and 7-14 solid maxillary teeth following the fang.

These are fast-moving whip-like diurnal snakes. One or more species is usually found in most parts of Australia and New Guinea, with the exception of the coldest parts, including Tasmania. As a rule these snakes have a strong dietary preference for skinks.

Egg-layers.

Content: *Demansia* Gray 1842.

Tribe Denisonini Tribe nov.

(Terminal Taxon: *Denisonia maculata*)

Diagnosis: Separated from all other Australasian land dwelling (non-sea snake) elapids by the following suite of characters.

Smooth-scalation with preocular in contact with the nasal, frontal longer than broad, at least one and a half times as broad as the supraocular, internasals present, suboculars absent, two large triangular parietals joined for three quarters of their length, 3-5 small, solid maxillary teeth follow the fang, 17 mid body rows, 120-150 ventrals, single anal, usually less than 40 all single subcaudals.

These are small to medium cryptozoic snakes found in the eastern half of continental Australia, usually associated with watercourses and floodplains or alternatively found in moist or riparian habitats.

All are usually nocturnal, being found by day sheltering under hard cover at ground level and especially fond of sheets of tin and other man-made cover.

Live-bearing.

Content: *Denisonia* Krefft 1869, *Drysdalia* Worrell 1961.

Tribe Ephalophini Burger and Natsuno, 1975

(Terminal taxon: *Ephalophis greyi*)

Diagnosis: In common with all sea snakes, they are identified by the presence of a vertically flattened, paddle-shaped tail, valvular nostrils and a lingual fossa (which is a depressed area that may appear on the lingual surface of selected anterior teeth).

Separated from all other sea snakes by the following suite of characters; wide ventral scales 3-5 times as wide as the adjacent body scales, fewer than 30 rows at the mid-body large posterior chin shields bordering on the mental groove, separated by a small scale and a pre-ocular scale is present.

Spine-like keels in *Ephalophis*. Smooth body scales in *Parahydrophis*.

Content: *Ephalophis* Smith 1931, *Parahydrophis* Burger and Natsuno 1934.

Subtribe Ephalophina Subtribe nov.

(Terminal taxon: *Ephalophis greyi*)

Diagnosis: In common with all sea snakes, they are identified

by the presence of a vertically flattened, paddle-shaped tail, valvular nostrils and a lingual fossa (which is a depressed area that may appear on the lingual surface of selected anterior teeth).

Separated from all other sea snakes by the following suite of characters; wide ventral scales 3-5 times as wide as the adjacent body scales, fewer than 30 rows at the mid-body large posterior chin shields bordering on the mental groove, separated by a small scale and a pre-ocular scale is present.

Separated from Parahydrophina by having spine-like keels on the scales.

Content: *Ephalophis* Smith 1931.

Subtribe Parahydrophina Subtribe nov.

(Terminal taxon: *Parahydrophis mertonii*)

Diagnosis: In common with all sea snakes, they are identified by the presence of a vertically flattened, paddle-shaped tail, valvular nostrils and a lingual fossa (which is a depressed area that may appear on the lingual surface of selected anterior teeth).

Separated from all other sea snakes by the following suite of characters; wide ventral scales 3-5 times as wide as the adjacent body scales, fewer than 30 rows at the mid-body large posterior chin shields bordering on the mental groove, separated by a small scale and a pre-ocular scale is present.

Separated from Ephalophina by having smooth body scales.

Content: *Parahydrophis* Burger and Natsuno 1934.

Tribe Furinini Tribe nov.

(Terminal Taxon: *Furina diadema*)

Diagnosis: Separated from all other Australasian land dwelling (non-sea snake) elapids by the following suite of characters: shiny smooth scales, 15-21 mid-body rows, divided anal plate, 25-70 all divided subcaudals, divided or undivided nasal that's widely separated from the preocular, no suboculars; the head is invariably darker than the body; there is also one of the following; 1/ a contrasting red, orange, yellowish or pale cream patch across the nape, especially in younger specimens (Genera *Furina* and *Glyphodon*) or; 2/ a characteristic yellow or whitish band at least partly encircling the top of the head, often incorporating a narrow to broad post-crainal nape (Genus *Cacophis*); seven or more solid maxillary teeth follow the fang, ventrally the colour is an immaculate white or cream; never exceeds a metre in total length, as a rule most species attain less than half this length.

Oviparous, with recorded clutches under 10 eggs that are usually elongate in shape.

Known as skink feeders, diet may include other small vertebrates.

Content: *Cacophis* Günther 1863, *Furina* Duméril 1853, *Glyphodon* Günther 1858

Tribe Hemiaspini Tribe Nov.

(Terminal Taxon: *Hemiaspis signata*)

Diagnosis: Separated from all other Australasian land dwelling (non-sea snake) elapids by the following suite of characters: These are moderately built snakes, the tail does not end in a soft spine, all subcaudals are undivided, the scales are smooth, the anal is normally divided and the subcaudals all single.

Further identified and separated by the following characters: Blunt snout, smooth scales with 17 mid-body rows, internasals present, no suboculars, 3-5 small solid maxillary teeth following the fang. The dorsal colouration is usually olive to brown, although both albinos and melanistic individuals are known. Normally, there is black pigment between the scales. Eye large and pupil round.

Only two described species within the one genus within this tribe.

Usually if not always diurnal in the case of *H. signata*, although *H. dameli* becomes crepuscular to nocturnal in warm weather.

The snakes are generally under 60 cm in total length, but rarely females of *Hemiaspis signata* may exceed this. Restricted to coastal and inland eastern Australia.

Live bearing with recorded litter sizes to 20, but less than half this number is more common.

Occupies a range of habitats where they occur, but in drier inland areas, invariably associated with watercourses. These snakes are especially partial to man-made rubbish such as car doors, sheets of tin and the like as found at rubbish tips.

Diet seems to consist mainly of skinks and small frogs.

While the bites from these snakes are not regarded as medically significant, there are reports of herpetologists bitten becoming quite ill and being taken to hospital, when bitten by large specimens of *H. signata*. It should be noted that most specimens found by snake collectors in Australia are "free handled" and rarely if ever bite.

Content: *Hemiaspis* Fitzinger 1860.

Content of genus *Hemiaspis*: *H. damelli* (Günther 1876), *H. signata* (Jan 1859)

Tribe Hulimkini Tribe Nov.

(Terminal taxon: *Hulimkai fasciata*)

Diagnosis: Separated from all other Australasian and Melanesian land dwelling (non-sea snake) elapids by the following suite of characters: No suboculars or curved tail spine at the end of the tail; the scalation is smooth and shiny with 17 (rarely 19) mid body rows; 140-185 ventrals that are not in any way keeled or notched; no suboculars; frontal longer than broad and more than one and half times as broad as the supraocular; no barring of the labials; internasals present; 20-40 all single subcaudals, single anal; 3-7 small solid maxillary teeth follow the fang; eye is of a medium size, the latter trait separating this snake from all other species of the genera (*Cryptophis* Worrell 1961, *Parasuta* Worrell 1961, *Rhinoplocephalus* Müller 1885, *Suta* Worrell 1961, *Unechis* Worrell 1961)(known herein as Tribe Sutini Tribe Nov.)(refer to elsewhere in this paper); further separated from snakes within Tribe Sutini Tribe Nov. by the fact that snakes (one species only) within this tribe have a well-defined dorsal pattern consisting of dark (near black) and lighter (usually brown) blotches on the dorsal surface forming a general patterned appearance not seen in the species within Tribe Sutini Tribe Nov..

A western Australian endemic, it is further separated from Tribe Sutini Tribe Nov. snakes by its proportionately longer body.

Note the relevant taxon identified here is seen in most texts under the name *Suta fasciata* (e.g. Cogger 2000) or *Denisonia fasciata* (e.g. Shine 1985), but was placed in a new genus *Hulimkai* gen. nov. in a paper published simultaneously with this.

Content: *Hulimkai* gen. nov. (see Hoser 2012c)

Content Genus *Hulimkai* gen. nov.: *Hulimkai fasciata* (Rosen 1905).

Tribe Hydrelapini Tribe nov.

(Terminal taxon: *Hydrelaps darwinensis*)

Diagnosis: In common with all sea snakes, they are identified by the presence of a vertically flattened, paddle-shaped tail, valvular nostrils and a lingual fossa (which is a depressed area that may appear on the lingual surface of selected anterior teeth).

Separated from all other sea snakes by the following suite of characters; large ventrals, at least three times wide as the adjacent body scales, numbering 163-172, anal divided, 27-39 usually single subcaudals, but occasionally some anterior ones are divided, no preocular scale, nasal scales in broad contact, six or more supralabials, posterior chin shields at least as large as the anterior chin shields which are separated by the mental

groove. Scales are smooth and imbricate, with 25-30 mid body rows. Fangs are followed by 3-6 solid maxillary teeth.

Colouration is cream or yellowish above, the body having 35-45 dark rings or cross-bands, each roughly twice as broad as the paler interspaces and usually complete on the belly. Sometimes the bands are displaced on the vertebral line. 5-8 complete dark rings on the tail.

The subcaudals are sometimes completely black. The head is blackish, with cream or yellow variegations. The head shields are enlarged and regular. Preocular scales are absent, the prefrontal borders the eye.

The single known species *Hydrelaps darwinensis* Boulenger 1896 is commonly encountered on mudflats associated with mangroves.

Content: *Hydrelaps* Boulenger 1896.

Tribe Hydrophiini Fitzinger, 1843

(Terminal taxon: *Hydrophis gracilis*)

Diagnosis: In common with all sea snakes, they are identified by the presence of a vertically flattened, paddle-shaped tail, valvular nostrils and a lingual fossa (which is a depressed area that may appear on the lingual surface of selected anterior teeth).

In the absence of features that would place sea snakes another tribe, the sea snake must be within this tribe.

Diagnoses of other tribes follows herein as part of this diagnosis as their exclusions from this tribe forms part of the diagnosis of this tribe.

Tribe Aipysurini Tribe nov. are separated by the following characteristics. These are moderate to large sea snakes, known mainly from the Australian region, including New Guinea and the Coral Sea east to New Caledonia.

Separated from all other sea snakes by the following suite of characters; large ventral scales, each at least three times as large as the adjacent body scales, nasals in contact, six or more supralabials, posterior chin shields are usually reduced and separated by one or more small scales and a preocular scale is present, 120-195 ventrals.

Alternatively, (in the case of *Emydocephalus*), the genus is separated from all other sea snakes by the possession of only three supralabials, the second being very elongated and below the eye.

Tribe Ephalophini is separated from all other sea snakes by the following suite of characters; wide ventral scales 3-5 times as wide as the adjacent body scales, fewer than 30 rows at the mid-body large posterior chin shields bordering on the mental groove, separated by a small scale and a pre-ocular scale is present.

Spine-like keels in *Ephalophis*. Smooth body scales in *Parahydrophis*.

Tribe Hydrelapini Tribe nov. is separated from all other sea snakes by the following suite of characters; large ventrals, at least three times wide as the adjacent body scales, numbering 163-172, anal divided, 27-39 usually single subcaudals, but occasionally some anterior ones are divided, no preocular scale, nasal scales in broad contact, six or more supralabials, posterior chin shields at least as large as the anterior chin shields which are separated by the mental groove. Scales are smooth and imbricate, with 25-30 mid body rows. Fangs are followed by 3-6 solid maxillary teeth.

Colouration is cream or yellowish above, the body having 35-45 dark rings or cross-bands, each roughly twice as broad as the paler interspaces and usually complete on the belly. Sometimes the bands are displaced on the vertebral line. 5-8 complete dark rings on the tail.

The subcaudals are sometimes completely black. The head is blackish, with cream or yellow variegations. The head shields

are enlarged and regular. Preocular scales are absent, the prefrontal borders the eye.

Subfamily Laticaudinae (and tribe Laticaudini) are separated from all other sea snakes by the following suite of characters: imbricate body scales, body with numerous black cross bands, broad ventral scales that are more than half the width of the body, laterally placed nostrils, nasals separated by internasals and the maxillary bone extends beyond the palatine bone.

Unlike all other sea snakes that give birth to live young, these return to land to lay eggs.

These snakes are partly terrestrial, often being found in rocky or coral crevices along shorelines, in mangrove swamps and similar, sometimes a sizeable distance from water.

Aggregations on land are commonly seen.

Content: *Acalyptophis* Boulenger 1896, *Astrotia* Fischer 1856, *Chitulia* Gray 1849, *Disteira* Lacépède 1804, *Enhydrina* Gray 1849, *Hydrophis* Sonnini and Latrielle 1802, *Kerilia* Gray 1849, *Kolpophis* Smith 1926, *Pelamis* Daudin 1803, *Lapemis* Gray 1835, *Leioselasma* Lacépède 1804, *Microcephalophis* Lesson 1832, *Polyodontognathus* Wall 1921, *Praescutata* Wall 1921, *Thalassophis* Schmidt 1852.

Subtribe Hydrophiina subtribe nov.

(Terminal taxon: *Hydrophis gracilis*)

Diagnosis: Diagnosis for this subtribe is as for the above tribe and by exclusion from the subtribe Pelamiina Subtribe Nov. below.

Subtribe Pelamiina Subtribe nov. is separated from Subtribe Hydrophiina subtribe nov. by the following suite of characters; large head, not particularly distinct from the thick but slightly narrower neck and a robust body form, small to very small scales. The ventrals are small, rarely much larger than the adjacent body scales and often barely recognisable posteriorly. The head shields are enlarged and regular. Body scales are juxtaposed.

Tribe Aipysurini Tribe nov. are separated by the following characteristics. These are moderate to large sea snakes, known mainly from the Australian region, including New Guinea and the Coral Sea east to New Caledonia.

Separated from all other sea snakes by the following suite of characters; large ventral scales, each at least three times as large as the adjacent body scales, nasals in contact, six or more supralabials, posterior chin shields are usually reduced and separated by one or more small scales and a preocular scale is present, 120-195 ventrals.

Alternatively, (in the case of *Emydocephalus*), the genus is separated from all other sea snakes by the possession of only three supralabials, the second being very elongated and below the eye.

Tribe Ephalophini is separated from all other sea snakes by the following suite of characters; wide ventral scales 3-5 times as wide as the adjacent body scales, fewer than 30 rows at the mid-body large posterior chin shields bordering on the mental groove, separated by a small scale and a pre-ocular scale is present.

Spine-like keels in *Ephalophis*. Smooth body scales in *Parahydrophis*.

Tribe Hydrelapini Tribe nov. is separated from all other sea snakes by the following suite of characters; large ventrals, at least three times wide as the adjacent body scales, numbering 163-172, anal divided, 27-39 usually single subcaudals, but occasionally some anterior ones are divided, no preocular scale, nasal scales in broad contact, six or more supralabials, posterior chin shields at least as large as the anterior chin shields which are separated by the mental groove. Scales are smooth and imbricate, with 25-30 mid body rows. Fangs are followed by 3-6 solid maxillary teeth.

Colouration is cream or yellowish above, the body having 35-45 dark rings or cross-bands, each roughly twice as broad as the paler interspaces and usually complete on the belly. Sometimes the bands are displaced on the vertebral line. 5-8 complete dark rings on the tail.

The subcaudals are sometimes completely black. The head is blackish, with cream or yellow variegations. The head shields are enlarged and regular. Preocular scales are absent, the prefrontal borders the eye.

Subfamily Laticaudinae (and tribe Laticaudini) are separated from all other sea snakes by the following suite of characters: imbricate body scales, body with numerous black cross bands, broad ventral scales that are more than half the width of the body, laterally placed nostrils, nasals separated by internasals and the maxillary bone extends beyond the palatine bone.

Unlike all other sea snakes that give birth to live young, these return to land to lay eggs.

These snakes are partly terrestrial, often being found in rocky or coral crevices along shorelines, in mangrove swamps and similar, sometimes a sizeable distance from water.

Aggregations on land are commonly seen.

Content: *Acalyptophis* Boulenger 1896, *Astrotia* Fischer 1856, *Chitulia* Gray 1849, *Disteira* Lacépède 1804, *Enhydryna* Gray 1849, *Hydrophis* Sonnini and Latrielle 1802, *Kerilia* Gray 1849, *Leioselasma* Lacépède 1804, *Microcephalophis* Lesson 1832, *Polyodontognathus* Wall 1921, *Thalassophis* Schmidt 1852.

Subtribe Pelamiina Subtribe nov.

(Terminal taxon: *Pelamis platurus*)

Diagnosis: In common with all sea snakes, they are identified by the presence of a vertically flattened, paddle-shaped tail.

Subtribe Pelamiina Subtribe nov. is separated from Subtribe Hydrophiina Subtribe nov. by the following suite of characters: large head, not particularly distinct from the thick but slightly narrower neck and a robust body form, small to very small scales. The ventrals are small, rarely much larger than the adjacent body scales and often barely recognisable posteriorly. The head shields are enlarged and regular. Body scales are juxtaposed.

Pelamis is not like any other sea snake. The monotypic genus, whose sole species has a unique colouration among sea snakes which consists of a large dark brown stripe running along the mid dorsal line, with wider areas of yellow or paler brown on the flanks.

The posterior and tail is yellowish with darker blotches reducing to finer spots.

Content: *Pelamis* Daudin 1803, *Kolpophis* Smith 1926, *Lapemis* Gray 1835, *Praescutata* Wall 1921.

Tribe Micropechiini Tribe nov.

(Terminal Taxon: *Micropechis ikaheka*)

Diagnosis: Separated from all other Australasian and Melanesian land dwelling (non-sea snake) elapids by the following suite of characters: One of the following: 1/ Relatively stocky in build with a relatively short tail, head narrow and only slightly broader and distinct from the neck, eyes very small and with a round pupil; scales are glossy and smooth with 15 mid body rows, 178-223 ventrals, divided anal, 37-55 all paired subcaudals, 6 supralabials with the third and fourth contacting the eye and temporolabial between the fifth and sixth, no loreal or suboculars; while colour is highly variable the head is usually light or dark grey and separated from the neck which has cream or yellow colouration, sometimes tipped with darker pigment; by mid-body the darker pigment becomes a series of darker edged cross-bands or similar markings, increasing in width and frequency as one moves down the snake's body, with this increasing to the tail region which is usually dark or black; ventrally the colour is creamish yellow, edged with black or

brown; labials, throat and chin may be yellow; 2/ alternatively the colour may be strongly banded along the entire body with dark pigment on the snout and a mainly white or light coloured head; alternatively the colour may be more-or-less plain dorsally (although scales may be dark etched) with some specimens showing the partial formation of cross-bands forming from the lower flanks, with a differing scale combination including occasionally a small loreal present, and both single and divided subcaudals; 3/ alternatively, with a slender cylindrical body, narrow flattened head, usually uniform dorsal colouration (except in juveniles (adults rarely), that may have one of the following three; a pale prefrontal band across the snout anterior to the eyes; a pale parietal band across the head posterior to the eyes, or a pale nuchal band across the neck behind the head and variable scalation that may include both divided and undivided anal plate and subcaudals.

Content: *Aspidomorphus* Fitzinger 1843, *Loveridgelaps* McDowell 1970, *Micropechis* Boulenger 1896, *Salomonelaps* McDowell 1970, *Toxicocalamus* Boulenger 1896.

Subtribe Aspidomorphina Subtribe nov.

(Terminal Taxon: *Aspidomorphus muelleri*)

Diagnosis: Separated from all other Australasian and Melanesian land dwelling (non-sea snake) elapids and others in the tribe Micropechiini by the following suite of characters: Snakes of moderate to slender build, usually around 400 mm in total length as adults and never more than 650 mm as adults; head flattened and slightly distinct from the neck which is noticeably narrower but not unduly narrow; shortish tail, small to medium sized eye with a vertically elliptical pupil, although this is hard to determine in specimens by day, colouration is highly variable, but always includes a white bar running from the snouth, below (but joining) the eye and posterior to the neck, where it fuses to the dorsal ventral colour change; dorsally colouration is usually a ground colour and the lighter venter is usually one colour, scalation is smooth and shiny with 15 mid body rows, 138-182 ventrals, divided anal plate, 19-41 subcaudals, no loreal, 6 supralabials, with the third and fourth in contact with the eye, a single preocular in contact with the nasal and second supralabial, 1-2 postoculars and 7 infralabials; known as "Crowned snakes", this is because many individuals have a distinct lighter coloured crown on the top of the head and near neck region, often broken with darker pigment with a wide dark band running on either side of the head broadly in line with the eye and widening posteriorly; when a crown is not present there is usually a change in colour intensity in the scales in the same regions of the head.

Known to inhabit forests to an elevation of at least 1,500 metres.

Content: *Aspidomorphus* Fitzinger 1843.

Subtribe Loveridgelapina Subtribe nov.

(Terminal Taxon: *Loveridgelaps elapoides*)

Diagnosis: Separated from all other Australasian and Melanesian land dwelling (non-sea snake) elapids and others in the tribe Micropechiini by the following suite of characters: a snake of medium (average build), the colour may be strongly banded along the entire body, with bands that may or may not run under the ventral surface; dark pigment on the front of the snout and a mainly white or light coloured head, ending just beyond the back of the skull where an orangeish band commences; alternatively the colour may be more-or-less plain dorsally (although scales may be dark etched) with some specimens showing the partial formation of cross-bands forming from the lower flanks; the scales are smooth and glossy with 17 mid-body rows, 193-218 ventrals, single anal plate, 31-38 all divided subcaudals, no loreal or suboculars, divided or single nasals, usually 7 supralabials, with the third and fourth in contact with the eye, single pre-ocular and 1-2 postoculars.

Large specimens exceed a metre in total length. Known only from the Solomon Islands. Most commonly seen in rainforests in

proximity to streams.

Content: *Loveridgelaps* McDowell 1970, *Salomonelaps* McDowell 1970.

Subtribe Micropechiina Subtribe nov.

(Terminal Taxon: *Micropechis ikaheka*)

Diagnosis: Separated from all other Australasian and Melanesian land dwelling (non-sea snake) elapids and others in the tribe Micropechiini by the following suite of characters: Relatively stocky in build with a relatively short tail, head narrow and only slightly broader and distinct from the neck, eyes very small and with a round pupil; scales are glossy and smooth with 15 mid body rows, 178-223 ventrals, divided anal, 37-55 all paired subcaudals, 6 supralabials with the third and fourth contacting the eye and temporolabial between the fifth and sixth, no loreal or suboculars; while colour is highly variable the head is usually light or dark grey and separated from the neck which has cream or yellow colouration, sometimes tipped with darker pigment; by mid-body the darker pigment becomes a series of darker edged cross-bands or similar markings, increasing in width and frequency as one moves down the snake's body, with this increasing to the tail region which is usually dark or black; ventrally the colour is creamish yellow, edged with black or brown; labials, throat and chin may be yellow.

Content: *Micropechis* Boulenger 1896.

Subtribe Toxicocalamina Subtribe nov.

(Terminal Taxon: *Toxicocalamus longissimus*)

Diagnosis: Separated from all other Australasian and Melanesian land dwelling (non-sea snake) elapids and others in the tribe Micropechiini by the following suite of characters: Slender cylindrical body, narrow flattened head, usually uniform dorsal colouration (except in juveniles (adults rarely), that may have one of the following three; 1/ a pale prefrontal band across the snout anterior to the eyes; 2/ a pale parietal band across the head posterior to the eyes; 3/ or a pale nuchal band across the neck behind the head; regardless of other colouration or markings the vertebral scale row is generally darker than the adjacent scale rows resulting in the appearance of a darker vertebral stripe, although this is not visible in some individuals; ventral surfaces, throat, supralabials and lowest 2-3 dorsal scale rows are often an immaculate yellow or whitish colour; sometimes a dark median longitudinal stripe is visible running through each lower dorsal row, and a pair of similar stripes may be present on the ventrals continuing to the subcaudals, which are often darker than the more anterior ventrals; the scalation smooth and glossy, with scale counts variable, with anal plate and subcaudals being either divided or single; never more than a metre in total length and usually about half this as adults; oviparous. Unusual among Australasian elapids in having a diet consisting largely of soft bodied invertebrates including earthworms and fly pupae. Fossorial species known to occur in a range of habitats including forests (both lowland and montane), kunai grass and gardens.

Content: *Toxicocalamus* Boulenger 1896.

Tribe Notopseudonajini Tribe nov.

(Terminal Taxon: *Notopseudonaja modesta*)

Diagnosis: Separated from all other Australasian land dwelling (non-sea snake) elapids by the following suite of characters: Shiny smooth scales, 17 mid-body rows, 145-175 ventrals, anal divided, 35-55 divided subcaudals, nasal and pre-ocular scales in contact, no suboculars, 7-12 solid maxillary teeth following the fang; never exceeds a total length of 60 cm.

In common with snakes in the tribes Pseudonajini Tribe nov. and Oxyuranini Tribe nov. these snakes usually have distinct to indistinct markings on the venter (at least the forebody) which are yellow, orange or brown in colour over a lighter whiteish or cream background colour.

Notopseudonajini is separated from the tribes Pseudonajini Tribe nov. (Genera: *Dugitophis*, *Euprepisoma*, *Placidaserpens*, *Pseudonaja*) and Oxyuranini Tribe nov. by the fact that all species within those tribes/genera have in excess of 175 ventrals.

Further separated from Oxyuranini Tribe nov. by the lack of keeling on the dorsal mid neck scales and the presence of a divided anal.

Oviparous.

Found in most drier parts of Australia, except the south-east.

Most authorities recognise the genus *Notopseudonaja* as containing the single species taxon *N. modesta*. However a notable exception to this is Wells (2002) who recognised three species within the nominal taxon (namely adding *ramsayi* and *sutherlandi*) a view dissented by W. Wüster (see Uetz 2012).

I have seen two series of images of two snakes referable to *N. modesta*, one from western Queensland and one from the Pilbara in West Australia, both of which appear quite clearly to be of different species, the images supplied by Scott Eipper (now of Brisbane, Queensland). As of 2012, he is investigating the taxonomy of *N. modesta* with a view to resolving the species composition of the currently identified (single) taxon.

Content: *Notopseudonaja* Wells 2002.

Tribe Oxyuranini Tribe nov.

(Terminal Taxon: *Oxyuranus scutellus*)

Diagnosis: Separated from all other Australasian and Melanesian land dwelling (non-sea snake) elapids by the following suite of characters: Shiny smooth scales, with slightly keeled scales on the neck (not seen in tribes Notopseudonajini and Pseudonajini) and further separated from those tribes by the fact that the frontal shield is slightly longer than wide as opposed to being more-or-less square in Notopseudonajini and Pseudonajini; suboculars absent, 21-23 mid body rows, 220-250 ventrals, single anal (versus divided in Notopseudonajini and Pseudonajini), 45-80 divided subcaudals; ventral colouration is usually lightish in colour and may include, darker orange, brown or grey, flecks, squiggles, spots, other markings (especially towards the forebody and mid-body) or alternatively be plain and one colour; dorsal colour either uniform above or alternatively may have flecks, bands or combinations thereof, including sometimes blotches.

Oviparous.

Found in the northern 2/3 of continental Australia and also New Guinea.

Content: *Oxyuranus* Kinghorn 1923, *Parademansia* Kinghorn 1955 (the two genera have been merged by many authorities).

Tribe Pseudechini Tribe nov.

(Terminal Taxon: *Pseudechis porphyriacus*)

Diagnosis: Separated from all other Australasian and Melanesian land dwelling (non-sea snake) elapids by the following suite of characters: Smooth shiny scales with 17-19 mid-body rows, and no suboculars; usually but not always, anterior subcaudals are single, giving way to divided ones, however both extremes of all divided and all single are found within the tribe; the anal is usually but not always divided, but when not divided is invariably either partially divided or with a prominent line running down the middle, and by treating it as such, this may be taken to separate these snakes from the physically similar Oxyuranini Tribe Nov.; separated from the physically similar snakes within the tribes Pseudonajini Tribe nov. and Notopseudonajini Tribe nov. by the fact that there are two temporal scales between the fifth upper labial and the parietal scale/s, versus a single one in this position for Pseudonajini Tribe nov. and Notopseudonajini Tribe nov.; further separated from snakes in the tribe Oxyuranini Tribe Nov. by the absence of any scale keeling on the dorsal neck region; thick-set build with wide ventral scales, large eye and round pupil;

adults may exceed 2 metres in total length.

Oviparous (all genera except *Pseudechis*), viviparous (genus *Pseudechis*).

Large diurnal snakes found throughout most parts of continental Australia and southern New Guinea, including nearby islands, except the coldest parts of the southeast and Tasmania.

In warm weather some species may become crepuscular or nocturnal.

Content: *Cannia* Wells and Wellington 1983, *Pailsus* Hoser 1998, *Panacedechis* Wells and Wellington 1985, *Pseudechis* Wagler 1830 (all interpreted variously by different authorities, with the current extreme being all merged into a single genus *Pseudechis*).

Tribe Pseudonajini Tribe nov.

(Terminal Taxon: *Pseudonaja nuchalis*)

Diagnosis: Separated from all other Australasian and Melanesian land dwelling (non-sea snake) elapids by the following suite of characters: Shiny smooth scales, 17-21 mid-body rows, 175-235 ventrals, anal divided, 45-75 divided subcaudals (rarely a few anterior ones single for the taxon *Pseudechis textilis bicucullata*), nasal and preocular scales in contact, no suboculars, 7-12 solid maxillary teeth following the fang; round pupil; adults may exceed a total length of 60 cm, at times adults exceeding 2 metres; in common with snakes in the tribes Pseudonajini Tribe nov. and Oxyuranini Tribe nov. these snakes usually have distinct to indistinct markings on the venter (at least the forebody) which are yellow, orange or brown in colour over a lighter whiteish or cream background colour; Notopseudonajini is separated from the tribes Pseudonajini Tribe nov. (Genera: *Dugitophis*, *Euprepiosoma*, *Placidaserpens*, *Pseudonaja*) and Oxyuranini Tribe nov. by the fact that all species within those tribes/genera have in excess of 175 ventrals; Pseudonajini is separated from Oxyuranini Tribe nov. by the lack of keeling on the dorsal mid neck scales and a divided anal as opposed to single in Oxyuranini Tribe nov. Oviparous.

These are mainly diurnal snakes, that often chase live prey during daylight hours.

Found in most parts of Australia and New Guinea.

Content: *Dugitophis* Wells 2002, *Euprepiosoma* Fitzinger 1860, *Placidaserpens* Wells 2002, *Pseudonaja* Günther, 1858.

Tribe Simoselapini Tribe nov.

(Terminal Taxon: *Simoselaps bertholdi*)

Diagnosis: Separated from all other Australasian and Melanesian land dwelling (non-sea snake) elapids by the following suite of characters: Body with or without cross-bands, but if unbanded the belly is immaculate white or cream, all have a distinctive pair of black bars on the head, one between and including the eyes and a broader one across the nape; scalation is smooth and shiny with 21 or less mid-body rows, less than 240 ventrals, divided anal, less than 35 subcaudals, with at least some divided; a relatively short tail not ending in a spine of any sort; internasals present; no suboculars separate the eye from the labials; the nasal and preocular scales may be in contact or separated and the rostrum is almost as long as broad, in some species with a sharp anterior shovel-shaped edge; never exceeding 60 cm in total length.

Oviparous.

Found in most drier parts of Australia and the tropics. These snakes are burrowing species usually found on the surface on warm nights.

Content: *Simoselaps* Jan 1859 (includes *Neelaps* Günther 1863).

Tribe Sutini Tribe nov.

(Terminal Taxon: *Suta suta*)

Diagnosis: Separated from all other Australasian and Melanesian land dwelling (non-sea snake) elapids by the following suite of characters: No suboculars or curved tail spine at the end of the tail; the scalation is smooth and shiny with 15 mid body rows (in genera *Cryptophis* and *Rhinoplocephalus*), or 15-21 mid body rows (in genera *Parasuta*, *Suta* and *Unechis*); frontal longer than broad; internasals or supranasals present; no barring of the labials; 20-65 all single subcaudals, single anal; 2-7 small solid maxillary teeth follow the fang; eye ranges from small to medium.

Usually under 60 cm in total length, but one species *Cryptophis nigrescens* has been recorded in excess of 1 metre. It should be noted that *Cryptophis nigrescens* as recognised herein and in current texts (like Cogger 2000) is a composite of species.

Live bearing.

The taxon *Denisonia fasciata* Rosen 1905, placed most recently by most authors in the genus *Suta*, has been formally removed from that genus and placed in a monotypic genus by this author, formally named for the first time (see paper published simultaneously to this in Hoser 2012c). That genus is formally named as *Hulimkai* gen. nov. and it is easily separated from all other snakes in this tribe by both its considerably larger eye size, proportionately longer body and the fact that it is the only taxon among the group with a well-defined dorsal pattern. It is also quite different behaviourally from all others within this tribe.

As a result of these differences, that taxon is placed in a separate tribe defined within this paper, namely Hulimkini Tribe Nov..

Some authors, including Cogger 2000, have merged the genera within this tribe as listed below into two, namely *Rhinoplocephalus* (incorporating *Cryptophis* and *Rhinoplocephalus*) and *Suta* (incorporating *Parasuta*, *Suta* and *Unechis*). However the Cogger 2000 position is opposed by Wells (various papers) and others including Wilson and Swan (2003).

Content: *Cryptophis* Worrell 1961, *Parasuta* Worrell 1961, *Rhinoplocephalus* Müller 1885, *Suta* Worrell 1961, *Unechis* Worrell 1961.

Tribe Vermicellini Tribe nov.

(Terminal Taxon: *Vermicella annulata*)

Diagnosis: Separated from all other Australasian and Melanesian land dwelling (non-sea snake) elapids by the fact that the body colour pattern consists of alternate black and white bands.

Further separated by the following suite of characters: head relatively indistinct from neck, cylindrical build and of relatively even thickness throughout the entire body length, except near the rear of the body and tail; very short tails with less than 35 subcaudals, all of which are divided, smooth glossy scales, with 15 mid-body rows and no suboculars, 180-290 ventrals, divided anal plate.

These snakes rarely if ever bite humans. Most are found crossing roads at night and they occur in most parts of continental Australia. The only genus in the tribe *Vermicella* has had several species described, but not all are currently recognised within the herpetological community, indicating the need for further research to determine the status of the various forms.

Content: *Vermicella* Günther 1858.

Subfamily Laticaudinae Cope 1879 (Sea Kraits)

(Terminal taxon: *Laticauda laticaudata*)

Diagnosis: In common with all sea snakes, they are identified by the presence of a vertically flattened, paddle-shaped tail.

They are separated from all other sea snakes by the following suite of characters: imbricate body scales, body with numerous black cross bands, broad ventral scales that are more than half the width of the body, laterally placed nostrils, nasals separated by internasals and the maxillary bone extends beyond the

palatine bone.

Unlike all other sea snakes that give birth to live young, these return to land to lay eggs.

These snakes are partly terrestrial, often being found in rocky or coral crevices along shorelines, in mangrove swamps and similar, sometimes a sizeable distance from water.

Aggregations on land are common.

Content: *Laticauda* Laurenti 1768, *Pseudolaticauda* Kharin 1984.

Tribe Laticaudini Cope 1879

(Terminal taxon: *Laticauda laticaudata*)

Diagnosis: See as for subfamily (above).

In common with all sea snakes, they are identified by the presence of a vertically flattened, paddle-shaped tail.

They are separated from all other sea snakes by the following suite of characters: imbricate body scales, body with numerous black cross bands, broad ventral scales that are more than half the width of the body, laterally placed nostrils, nasals separated by internasals and the maxillary bone extends beyond the palatine bone.

Unlike all other sea snakes that give birth to live young, these return to land to lay eggs.

These snakes are partly terrestrial, often being found in rocky or coral crevices along shorelines, in mangrove swamps and similar, sometimes a sizeable distance from water.

Aggregations on land are common.

Content: *Laticauda* Laurenti 1768, *Pseudolaticauda* Kharin 1984.

FAMILY: HOMOROSELAPIDAE FAMILY NOV.

(Terminal Taxon: *Homoroselaps lacteus*)

Diagnosis: Separated from all other Elapids, Colubrids and Atractaspididae by the following suite of characters: Never more than 65 cm total length as an adult, usually averaging 20-40 cm; very thin with a build bordering on cylindrical with body thickness being very thin and very similar along the entire length of the body to near the tail; head small, relatively short and marginally distinct from the neck; 15 mid body rows, 160-239 ventrals, divided anal plate, 22-43 paired subcaudals, tail medium to short in length; 6 Upper labials, numbers 3 and 4 entering the eye, 5-6 lower labials, as well as one pre-ocular and one post-ocular, temporals are either 0+1 or 1+1; while colour is somewhat variable, the pattern and configuration is quite unlike any other snake; it invariably is glossy and blackish on top, with orange running along the mid dorsal line either broken or unbroken, often running on top of a dorsal pattern of large black blotches etched with thick yellow reticulations, the pattern sometimes being reduced to black with a white spot in the centre of each scale, or somewhere between the two configurations listed, or alternatively mainly black dorsally with a thick yellow or orange line running along the spine, commencing at the snout and yellow or orange along the flanks, separated from the black by a well-defined boundary on the mid flanks; in all cases the yellow or orange mid-dorsal line commences on the head from in front of the eye, even if broken by black; possesses fangs and venom; oviparous, with clutches up 16 eggs recorded, although less than half this number is more common; recorded diet consists exclusively of smaller reptiles.

Of immediate note to anyone who sees these snakes is their extremely small size. While they live and feed at ground level, they are not regarded as burrowers.

Comments: These snakes are commonly called the African Harlequin Snakes, or less often African Coral Snakes. The venom is not regarded as being of medical significance and due to the tiny size of the snake, it's extremely small gape and reluctance to bite, bites are not common. In 2009 I was bitten by an adult *Homoroselaps lacteus* in Cape Town South Africa

(after pushing the snake's limits of patience by tormenting it for filming and photography for some time) and suffered nothing more than extremely minor pain, even though both fangs penetrated the skin.

Reports of pain suffered from bites from these snakes may be exaggerated by persons bitten, including those with little expertise with snakes and great fears about the consequences of a bite.

Based on the fact that these snakes remain common in built up areas, they cannot be regarded as under any known threat of extinction. They appear to be endemic to South Africa.

The specimen I found in Cape Town in 2009 was found in mid winter on a sunny day under a car tyre next to a fence on the side of the main N2 highway near the general vicinity of Mfuleni, (adjacent to the only partially demolished brick house surrounded by grassed area near the road in the area between Cape Town airport and Sir Lowry's Pass). The nearby area was disused land with sandy soil and numerous man made dirt mounds in the area. It was inactive, but fast moving due to it's basking under a piece of exposed cover. While this snake would wriggle to escape, this action would reduce or cease if the snake was balled-up and held within enclosed hands. Two and a half week's of intensive collecting around Cape Town and environs, including in optimal habitat such as that around rubbish dumps in sandy habitat near Mitchells Plain failed to yield any other specimens of this taxon.

Marias 2004, reports that the species *lacteus* is sometimes locally common and that it's only congener *dorsalis*, from the east of South Africa is rare and seldom seen.

In terms of *dorsalis*, the apparent rarity may be due to secretive behaviour of the snake rather than a genuine lack of specimens in the wild.

Content: *Homoroselaps* Jan 1858.

TRIBE HOMOROSELAPINI

(Terminal Taxon: *Homoroselaps lacteus*)

Diagnosis: Separated from all other elapids, colubrids and Atractaspididae by the following suite of characters: Never more than 65 cm as an adult, usually averaging 20-40 cm; very thin with a build bordering on cylindrical with body thickness very similar along the entire length of the body to near the tail; head small, relatively short and marginally distinct from the neck; 15 mid body rows, 160-239 ventrals, divided anal plate, 22-43 paired subcaudals, tail medium to short in length; 6 Upper labials, numbers 3 and 4 entering the eye, 5-6 lower labials, as well as one pre-ocular and one post-ocular, temporals are either 0+1 or 1+1; while colour is somewhat variable, the pattern and configuration is quite unlike any other snake; it invariably is glossy and blackish on top, with orange running along the mid dorsal line either broken or unbroken, often running on top of a dorsal pattern of large black blotches etched with thick yellow reticulations, the pattern sometimes being reduced to black with a white spot in the centre of each scale, or somewhere between the two configurations listed, or alternatively mainly black dorsally with a thick yellow or orange line running along the spine, commencing at the snout and yellow or orange along the flanks, separated from the black by a well-defined boundary on the mid flanks; in all cases the yellow or orange mid-dorsal line commences on the head from in front of the eye, even if broken by black; possesses fangs and venom; oviparous, with clutches up 16 eggs recorded, although less than half this number is more common; recorded diet consists exclusively of smaller reptiles.

Of immediate note to anyone who sees these snakes is their extremely small size. While they live and feed at ground level, they are not regarded as burrowers.

While venomous, the bites are not of medical significance.

Content: *Homoroselaps* Jan 1858.

Genus content *Homoroselaps* Jan 1858: *H. lacteus* (Linnaeus 1758), *H. dorsalis* (Smith 1849).

REFERENCES CITED

- Campbell, J. A. and Lamar, W. W. 2004. *The venomous reptiles of the Western Hemisphere*, (2 Vols), Cornstock, USA.
- Cogger, H. G. 1975. (et. seq. to 2000, to sixth edition) *Reptiles and Amphibians of Australia*. Reed, Sydney, Australia.
- Cogger, H. G. 2000. (see above).
- Cogger, H. G., Cameron, E. E. and Cogger, H. M. 1983. *Zoological Catalogue of Australia (1) Amphibia and Reptilia*, Australian Government Publishing Service, Canberra, ACT, Australia. 319 pp.
- Deufel, A. and Cundall, D. 2010. Functional morphology of the palato-maxillary apparatus in "Palatine dragging" snakes (Serpentes: Elapidae: *Acanthophis*, *Oxyuranus*). *Journal of Morphology* 271(1):73-85.
- Hoser, R. T. 2012a. A reassessment of the Burrowing Asps, *Atractaspis* Smith 1849 with the erection of a new genus and tribe (Serpentes: Atractaspidae). *Australasian Journal of Herpetology* Issue 11:56-58.
- Hoser, R. T. 2012b. A reclassification of the Rattlesnakes; species formerly exclusively referred to the Genera *Crotalus* and *Sistrurus* and a division of the elapid genus *Micrurus*. *Australasian Journal of Herpetology* Issue 11:2-24.
- Hoser, R. T. 2012c. The description of a new genus of West Australian snake and eight new taxa in the genera *Pseudonaja* Gunther, 1858, *Oxyuranus* Kinghorn, 1923 and *Panacledochis* Wells and Wellington, 1985 (Serpentes: Elapidae). *Australasian Journal of Herpetology* Issue 11:32-50.
- Kelly, K.M.R. and Barker, N.P. and Villet, M.H. (2003) Phylogenetics of advanced snakes (Caenophidia) based on four mitochondrial genes. *Systematic Biology* 52 (4). pp. 439-459.
- Kelly, C. M. R., Nigel, P. Barker, M. H. Villet and Broadley, D. G. 2009. Phylogeny, biogeography and classification of the snake superfamily elapoidea: A rapid radiation in the late Eocene. *Cladistics* 25: 38-63.
- Keogh, J. S. 1999. Evolutionary implications of hemipenial morphology in the terrestrial Australian elapid snakes. *Zoological Journal of the Linnean Society* 125:239-278.
- Keogh, J. S., Shine, R. and Donnellan, S. C. 1998. Phylogenetic relationships of Terrestrial Australo-Papuan elapid snakes based on cytochrome b and 16S rRNA sequences. *Molecular Phylogenetics and Evolution* 10(1):67-81.
- Lawson, R., Slowinski, J. B., Crother, B. I., Burbrink, F. T. 2005. Phylogeny of the Colubroidea (Serpentes): new evidence from mitochondrial and nuclear genes. *Mol Phylogenet Evol.* 2005;37:581-601. doi: 10.1016/j.ympev.2005.07.016.
- Lukoschek, V. and Keogh, J. S. 2006. Molecular phylogeny of sea snakes reveals a rapidly diverged adaptive radiation. *Biological Journal of the Linnean Society* 89(3):523-539.
- Marias, J. 2004. A complete guide to the snakes of Southern Africa. Struik, Cape Town, South Africa. 312 pp.
- McDowell, S. B. 1970. On the status and relationships of the Solomon Island elapid snakes. *Journal of Zoology*, London 161:145-190.
- McDowell, S. B. 1987. Systematics. In: R.A. Siegel, J.T. Collins, and S.S. Novak (eds.), *Snakes: ecology and evolutionary biology*. MacMillan Publ. Co, New York, pp. 3-50.
- Mengden, G. A. 1983. The taxonomy of Australian elapid snakes: A review. *Records of the Australian Museum* 35(5):195-222.
- Pyron, R. A., et al. 2010. The phylogeny of advanced snakes (Colubroidea), with discovery of a new subfamily and comparison of support methods for likelihood trees. *Mol. Phylogenet. Evol.*
- Rasmussen, A. R., Murphy J. C., Ompi, M, Gibbons, J. W., Uetz, P. 2011. Marine Reptiles. *PLoS ONE* 6(11): e27373. doi:10.1371/journal.pone.0027373
- Ride, W. D. L. (ed.) et. al. (on behalf of the International Commission on Zoological Nomenclature 2000. *International code of Zoological Nomenclature*. The Natural History Museum - Cromwell Road - London SW7 5BD - UK (also commonly cited as "ICZN 1999").
- Shine, R. 1985. Ecological evidence on the phylogeny of Australian elapid snakes. Pp. 255-260 in *Biology of Australasian Frogs and Reptiles*, ed. By Grigg, G., Shine, R. and Ehmann, H. Royal Zoological Society of NSW, Australia.
- Shine, R. and Keogh, J. S. 1996. Food habits and reproductive biology of the Endemic Melanesian Elapids: Are tropical snakes really different? *Journal of Herpetology* 30(2):258-247.
- Slowinski, J. B., Boundy, J. and Lawson, R. 2001. The phylogenetic relationships of Asian coral snakes (Elapidae: *Calliophis* and *Maticora*) based on morphological and molecular characters. *Herpetologica* 57 (2): 233-245.
- Slowinski, J. B., Knight, A. and Rooney, A. P. 1997. Inferring species trees from gene trees: A phylogenetic analysis of the elapidae (Serpentes) based on the Amino acid sequences of venom proteins. *Molecular Phylogenetics and Evolution* 8(3):349-362.
- Smith, H. M., Smith, R. B. and Lewis Sawin, H. 1977. A summary of Snake Classification (Reptilia, Serpentes). *Journal of Herpetology* 11(2):115-121.
- Uetz, P. (ed.) 2012. The Reptile Database, *Pseudonaja modesta* Gunther 1872 http://reptile-database.reptarium.cz/species?genus=Pseudonaja&species=modesta&search_param=%28%28taxon%3D%27Elapidae%27%29%29, downloaded on 3 March 2012
- Wallach, V. 1985. A cladistic analysis of the terrestrial Australian elapidae. Pages 223-53 in *Biology of Australasian Frogs and Reptiles*, ed. By Gordon Grigg, Richard Shine and Harry Ehmann, Royal Zoological Society of New South Wales.
- Wells, R. W. 2002. Taxonomy of the Genus *Pseudonaja* (Reptilia: Elapidae) in Australia. *Australian Biodiversity Record* (7): 1-41 (as published online in pdf).
- Wells, R. W. 2007. Some taxonomic and nomenclatural considerations on the class reptilia in Australia. The sea snakes of Australia. An introduction to the members of the families Hydrophiidae and Laticaudidae in Australia with a new Familial and Generic arrangement. *Australian Biodiversity Record* (May) 8:1-124.
- Wells, R. W. 2012. Some taxonomic and nomenclatural considerations on the class reptilia in Australia. A reclassification of the genus *Lerista* (Scincidae), including the descriptions of new genera. *Australian Biodiversity Record* 2012(1):1-361.
- Wells, R. W. and Wellington, C. R. 1983. A synopsis of the class Reptilia in Australia. *Australian Journal of Herpetology* 1 (3-4):73-129.
- Wells, R. W. and Wellington, C. R. 1985. A classification of the Amphibia and Reptilia of Australia. *Australian Journal of Herpetology*, Supplementary Series, (1):1-61.
- Wilson, S. and Swan, G. 2003. *A complete guide to the Reptiles of Australia*. Reed, New Holland, Sydney, Australia. 480 pp.

Australasian Journal of Herpetology

ISSN 1836-5698 (Print)

ISSN 1836-5779 (Online)

Online journals do not appear for a month after the actual and listed publication date of printed journals.
Minimum print run of first printings of hard copies of given issues is always fifty hard copies.

SUMMARY OF CURRENT ELAPID CLASSIFICATION (HOSER 2012)

FAMILY ELAPIDAE BOIE, 1827

Subfamily Bungarinae Eichwald, 1831 (Cobras)

Content: See within each tribe.

Tribe Bungarini Eichwald, 1831 (Asiatic Cobras)

(Terminal Taxon: *Bungarus candidus*)Content: *Bungarus* Daudin 1803.

Tribe Dendroaspini Tribe nov.

(Terminal Taxon: *Dendroaspis polylepis*)Content: *Dendroaspis* Schlegel 1848.

Tribe Elapsoidini Tribe nov.

(Terminal Taxon: *Elapsoidea sunderwallii*)Content: *Elapsoidea* Bocage 1866.

Tribe Najini Bonaparte, 1838 (Afroasian Cobras)

(Terminal Taxon: *Naja naja*)Content: *Aspidelaps* Fitzinger 1843, *Boulengerina* Dollo 1886, *Hemachatus* Fleming 1822, *Naja* Laurenti 1768, *Pseudohaje* Günther 1858, *Spracklandus* Hoser 2009, *Uraeus* Wagler 1830, *Walterinnesia* Lataste 1887.

Subtribe Najina Subtribe nov.

(Terminal Taxon: *Naja naja*)Content: *Aspidelaps* Fitzinger 1843, *Boulengerina* Dollo 1886, *Naja* Laurenti 1768, *Pseudohaje* Günther 1858, *Spracklandus* Hoser 2009, *Uraeus* Wagler 1830, *Walterinnesia* Lataste 1887.

Subtribe Hemachatusina Subtribe nov.

(Terminal Taxon: *Hemachatus hemachatus*)Content: *Hemachatus* Fleming 1822

Ophiophagini Tribe nov.

(Terminal Taxon: *Ophiophagus hannah*)Content: *Ophiophagus* Günther 1864.

Subfamily Elapinae Boie, 1827 (Coral Snakes)

Content: *Calliophis* Gray 1834, *Hemibungarus* Peters 1862, *Leptomicrurus* Schmidt 1937, *Maticora* Gray 1834, *Micruroides* Schmidt 1928, *Micrurus* Wagler 1824, *Parapistocalamus* Roux 1934, *Sinomicrurus* Slowinski et al., 2001.

Tribe Elapini Boie, 1827 (North American-North Asiatic Coral Snakes)

(Terminal Taxon: *Micrurus spixii*)Content: *Leptomicrurus* Schmidt 1937, *Micruroides* Schmidt 1928, *Micrurus* Wagler 1824, *Hoserelapidea* gen. nov. (see paper by Hoser 2012b).

Tribe Maticorini Tribe Nov. (South Asiatic Coral Snakes)

(Terminal Taxon: *Calliophis intestinalis*)Content: *Calliophis* Gray 1834, *Hemibungarus* Peters 1862, *Maticora* Gray 1834, *Sinomicrurus* Slowinski et al., 2001.

Tribe Parapistocalamini Tribe Nov.

(Terminal Taxon: *Parapistocalamus hedigeri*)Content: *Parapistocalamus* Roux 1934.

Subfamily Hydrophiinae Werner, 1890 (Palatine draggers)

Content: See lists for each tribe.

Tribe Acanthophiini Dowling, 1967

(Terminal Taxon: *Acanthophis antarcticus*)Content: *Acanthophis* Daudin 1803, *Austrelaps* Worrell 1963, *Echiopsis* Fitzinger 1843, *Hoplocephalus* Wagler 1830, *Notechis* Boulenger 1896, *Tropidechis* Günther 1863.

Subtribe Acanthophiina Subtribe nov.

(Terminal Taxon: *Acanthophis antarcticus*)Content: *Acanthophis* Daudin 1803.

Subtribe Hoplocephalina Subtribe nov.

(Terminal Taxon: *Hoplocephalus bungaroides*)Content: *Hoplocephalus* Wagler 1830.

Subtribe Notechiina Subtribe nov.

(Terminal Taxon: *Notechis scutatus*)Content: *Austrelaps* Worrell 1963, *Echiopsis* Fitzinger 1843, *Notechis* Boulenger 1896, *Tropidechis* Günther 1863.

Tribe Aipysurini Tribe nov.

(Terminal taxon: *Aipysurus laevis*)Content: *Aipysurus* Lacépède 1804, (including other sometimes recognised genera *Oceanus* Wells 2007, *Pelagophis* Peters and Doria 1878, *Smithohydrophis* Kharin 1981, *Stephanohydra* Tschudi 1837, *Tomogaster* Gray 1849), *Emydocephalus* Krefft 1869.

Tribe Apistocalamini Dowling, 1967

(Terminal taxon: *Ogmodon vitianus*)Content: *Ogmodon* Peters 1864.

Tribe Demansiini Tribe nov.

(Terminal Taxon: *Demansia psammophis*)Content: *Demansia* Gray 1842.

Tribe Denisonini Tribe nov.

(Terminal Taxon: *Denisonia maculata*)Content: *Denisonia* Krefft 1869, *Drysdalia* Worrell 1961.

Tribe Ephalophini Burger and Natsuno, 1975

(Terminal taxon: *Ephalophis greyi*)Content: *Ephalophis* Smith 1931, *Parahydrophis* Burger and Natsuno 1934.

Subtribe Ephalophina Subtribe nov.

(Terminal taxon: *Ephalophis greyi*)Content: *Ephalophis* Smith 1931.

Subtribe Parahydrophina Subtribe nov.

(Terminal taxon: *Parahydrophis mertonii*)Content: *Parahydrophis* Burger and Natsuno 1934.

Tribe Furinini Tribe nov.

(Terminal Taxon: *Furina diadema*)Content: *Cacophis* Günther 1863, *Furina* Duméril 1853, *Glyphodon* Günther 1858

Tribe Hemiaspini Tribe Nov.**(Terminal Taxon: *Hemiaspis signata*)****Content:** *Hemiaspis* Fitzinger 1860.**Content of genus *Hemiaspis*:** *H. damelli* (Gunther 1876), *H. signata* (Jan 1859)**Tribe Hulimkai Tribe Nov.****(Terminal taxon: *Hulimkai fasciata*)****Content:** *Hulimkai* gen. nov. (see Hoser 2012c)**Content Genus *Hulimkai* gen. nov.:** *Hulimkai fasciata* (Rosen 1905).**Tribe Hydrelapini Tribe nov.****(Terminal taxon: *Hydrelaps darwinensis*)****Content:** *Hydrelaps* Boulenger 1896.**Tribe Hydrophiini Fitzinger, 1843****(Terminal taxon: *Hydrophis gracilis*)****Content:** *Acalyptophis* Boulenger 1896, *Astrotia* Fischer 1856, *Chitulia* Gray 1849, *Disteira* Lacépède 1804, *Enhydrina* Gray 1849, *Hydrophis* Sonnini and Latrielle 1802, *Kerilia* Gray 1849, *Kolpophis* Smith 1926, *Pelamis* Daudin 1803, *Lapemis* Gray 1835, *Leioselasma* Lacépède 1804, *Microcephalophis* Lesson 1832, *Polyodontognathus* Wall 1921, *Praescutata* Wall 1921, *Thalassophis* Schmidt 1852.**Subtribe Hydrophiina subtribe nov.****(Terminal taxon: *Hydrophis gracilis*)****Content:** *Acalyptophis* Boulenger 1896, *Astrotia* Fischer 1856, *Chitulia* Gray 1849, *Disteira* Lacépède 1804, *Enhydrina* Gray 1849, *Hydrophis* Sonnini and Latrielle 1802, *Kerilia* Gray 1849, *Leioselasma* Lacépède 1804, *Microcephalophis* Lesson 1832, *Polyodontognathus* Wall 1921, *Thalassophis* Schmidt 1852.**Subtribe Pelamiina Subtribe nov.****(Terminal taxon: *Pelamis platurus*)****Content:** *Pelamis* Daudin 1803, *Kolpophis* Smith 1926, *Lapemis* Gray 1835, *Praescutata* Wall 1921.**Tribe Micropechiini Tribe nov.****(Terminal Taxon: *Micropechis ikaheka*)****Content:** *Aspidomorphus* Fitzinger 1843, *Loveridgelaps* McDowell 1970, *Micropechis* Boulenger 1896, *Salomonelaps* McDowell 1970, *Toxicocalamus* Boulenger 1896.**Subtribe Aspidomorphina Subtribe nov.****(Terminal Taxon: *Aspidomorphus muelleri*)****Content:** *Aspidomorphus* Fitzinger 1843.**Subtribe Loveridgelapina Subtribe nov.****(Terminal Taxon: *Loveridgelaps elapoides*)****Content:** *Loveridgelaps* McDowell 1970, *Salomonelaps* McDowell 1970.**Subtribe Micropechiina Subtribe nov.****(Terminal Taxon: *Micropechis ikaheka*)****Content:** *Micropechis* Boulenger 1896.**Subtribe Toxicocalamina Subtribe nov.****(Terminal Taxon: *Toxicocalamus longissimus*)****Content:** *Toxicocalamus* Boulenger 1896.**Tribe Notopseudonajini Tribe nov.****(Terminal Taxon: *Notopseudonaja modesta*)****Content:** *Notopseudonaja* Wells 2002.**Tribe Oxyuranini Tribe nov.****(Terminal Taxon: *Oxyuranus scutellus*)****Content:** *Oxyuranus* Kinghorn 1923, *Parademansia* Kinghorn 1955 (the two genera have been merged by many authorities).**Tribe Pseudechini Tribe nov.****(Terminal Taxon: *Pseudechis porphyriacus*)****Content:** *Cannia* Wells and Wellington 1983, *Pailsus* Hoser 1998, *Panacedechis* Wells and Wellington 1985, *Pseudechis* Wagler 1830 (all interpreted variously by different authorities, with the current extreme being all merged into a single genus *Pseudechis*).**Tribe Pseudonajini Tribe nov.****(Terminal Taxon: *Pseudonaja nuchalis*)****Content:** *Dugitophis* Wells 2002, *Euprepisoma* Fitzinger 1860, *Placidaserpens* Wells 2002, *Pseudonaja* Günther, 1858.**Tribe Simoselapini Tribe nov.****(Terminal Taxon: *Simoselaps bertholdi*)****Content:** *Simoselaps* Jan 1859 (includes *Neelaps* Günther 1863).**Tribe Sutini Tribe nov.****(Terminal Taxon: *Suta suta*)****Content:** *Cryptophis* Worrell 1961, *Parasuta* Worrell 1961, *Rhinoplocephalus* Müller 1885, *Suta* Worrell 1961, *Unechis* Worrell 1961.**Tribe Vermicellini Tribe nov.****(Terminal Taxon: *Vermicella annulata*)****Content:** *Vermicella* Günther 1858.**Subfamily Laticaudinae Cope 1879 (Sea Kraits)****(Terminal taxon: *Laticauda laticaudata*)****Content:** *Laticauda* Laurenti 1768, *Pseudolaticauda* Kharin 1984.**Tribe Laticaudini Cope 1879****(Terminal taxon: *Laticauda laticaudata*)****Content:** *Laticauda* Laurenti 1768, *Pseudolaticauda* Kharin 1984.**FAMILY: HOMOROSELAPIDAE FAMILY NOV.****(Terminal Taxon: *Homoroselaps lacteus*)****Content:** *Homoroselaps* Jan 1858.**Tribe Homoroselapiini****(Terminal Taxon: *Homoroselaps lacteus*)****Content:** *Homoroselaps* Jan 1858.**Genus content *Homoroselaps* Jan 1858:** *H. lacteus* (Linnaeus 1758), *H. dorsalis* (Smith 1849).