

***Boiga irregularis* (Bechstein, 1802): An invasive species complex busted! (Serpentes: Colubridae).**

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ABSTRACT

The Brown Tree Snake *Boiga irregularis* (Bechstein, 1802) is a taxon that achieved notoriety after it was inadvertently introduced into the island of Guam. There it proceeded to breed in massive numbers and decimated the local lizards and avifauna (Rodda and Fritts 1992, Rodda and Savidge 2007).

While various forms have been formally described, most authors have treated all as being variants of a single species. This remains the case even since a molecular study by Richmond *et al.* (2014) showed that there were deep phylogenetic divisions between populations.

Rodda *et al.* (1999) and again Rodda and Savidge (2007) noted this incongruity and for nearly a decade since 2007, there has been no advancement in that position. Furthermore the anomaly becomes even more apparent when one reconciles this situation with that of another related species complex *Dorisious dendrophila* (Boie, 1827), formerly known as *Boiga dendrophila* (Boie, 1827), a Sundaland species for which local populations exhibit similar divergences and have been assigned widely-recognized and used subspecies names for many years. These including six more than 100 years old and three more recent.

This paper corrects the anomaly and divides the *B. irregularis* group based on consistent morphological differences between forms. These also coincide with available molecular data.

The result here is ten subspecies, four of which have available names and the other six are assigned in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

A neotype is designated for *B. irregularis*.

Keywords: Taxonomy; Brown Tree Snake; snakes; genus; *Boiga*; species; *irregularis*; *fusca*; *laticeps*; *flavigastra*; *boydii*; *ornata*; *flavescens*; new subspecies; *halmaheraensis*; *buruensis*; *sudestensis*; *solomonensis*; *newbritainensis*; *roddai*; Solomon Islands; Solomons; Australia; Queensland, New South Wales, Northern Territory, Western Australia; New Guinea; Guam; Sulawesi; Obi; Guadalcanal; Halmahera; New Britain; Milne Bay; Tagula; Sudest Island; Buru; Ambon; Manus; Ceram.

INTRODUCTION

The Brown Tree Snake *Boiga irregularis* (Bechstein, 1802) is a species that achieved notoriety after it was inadvertently introduced into the island of Guam. There it proceeded to breed in massive numbers and decimated the local reptiles and avifauna as noted by Rodda and Fritts (1992) and Rodda and Savidge (2007).

This notoriety and environmental destruction has led to numerous studies and published observations in relation to these snakes including their various means of human assisted and non-human assisted dispersion, including transportation methods, speed of travel and the like.

Similar species within the genus *Boiga sensu lato* as described by Hoser (2012) have also been studied in detail.

Most wide-ranging species within *Boiga sensu lato* have had regional subspecies formally described and named and these names are widely used.

While various forms of *Boiga irregularis* from Australia and New Guinea have been formally described, most authors have treated all as being variants of a single species and this has also been the case for most biological and captive studies on these snakes. This treatment of all "*Boiga irregularis*" as a single taxon remains the case even since a molecular study by Richmond *et al.* (2014) showed that there were deep phylogenetic divisions between populations.

Rodda *et al.* (1999) and again Rodda and Savidge (2007) noted this incongruity and for nearly a decade since 2007, or two since 1999, there has been no advancement in that position.

In 2007, Rodda and Savidge wrote: "Most island isolates of Brown Tree Snakes do show genetic structure, but no distinctive forms have been formally recognized."

Furthermore the anomaly becomes even more apparent when one reconciles this situation with that of another species complex *Dorisious dendrophila* (Boie, 1827), formerly known as

Boiga dendrophila (Boie, 1827), better known as the Mangrove Snake, which is a Sundaland species for which local populations exhibit similar divergences and have been assigned widely-recognized and used subspecies names for many years. These include six more than 100 years old and three more recently assigned.

It is also notable that *Dorisius dendrophila* (Boie, 1827), would clearly be more suited to dispersal among nearby island groups than the species *B. irregularis*, which while inhabiting mangrove swamps and/or regularly venturing into them, does in fact prefer more *terra-firma* land-based habitats.

This paper corrects the anomaly, and divides the *B. irregularis* group based on consistent morphological differences between forms. These also coincide with the molecular data.

The basis of the division includes direct inspection of many hundreds of specimens, both live and in museums, over a forty year period from across most parts of the known distribution of *Boiga irregularis*.

This includes specimens from Australia, New Guinea, the Solomon Islands, and other islands, north and west of New Guinea.

The result here is ten identified subspecies, four of which have available names, with three being resurrected from synonymy.

The other six subspecies are assigned new names in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

The taxonomy is robust and conservative. While no populations are currently regarded as threatened with extinction, things can change rapidly. A necessary first step to conserving biodiversity is to have a proper inventory of it, which is further reason for these descriptions to be published now, rather than at a later date.

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

This is in view of the conservation significance attached to the formal recognition of unnamed species and on the basis that further delays may in fact put these otherwise unnamed taxa at greater risk of extinction should their status in the wild unexpectedly change.

A situation compounding the problems involving taxonomy and nomenclature of *B. irregularis* has been the absence of a type specimen. The original description matches that of the east Australian form and so it is appropriate that this be regarded as the form typical of the species. Most contemporary authors (e.g. Rodda and Savidge 2007) have done exactly that.

On that basis I hereby assign a neotype for the species *B. irregularis* which is done preceding the relevant subspecies descriptions.

Also it is relevant to point out that the earlier named subspecies were never properly defined by the original authors within the context of other forms. Hence these are redescribed herein in order to enable others to identify and separate each of the ten named forms and in the absence of relevant locality data.

MATERIALS AND METHODS

These are not formally explained in a number of my recent papers under the heading "Materials and methods" or similar, on the basis they are self evident to any vaguely perceptive reader. However, the process by which the following taxonomy and nomenclature in this and other recent papers by myself of similar form (in *Australasian Journal of Herpetology* issues 1-32), has been arrived at, is explained herein for the benefit of people who have recently published so-called "criticisms" online of some of my recent papers. They have alleged a serious "defect" by myself not formally explaining "Materials And Methods" under such a heading.

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

Genera and component species have been audited to see if their classifications are correct on the basis of known type specimens, locations and the like when compared with known phylogenies and obvious morphological differences between like species.

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

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

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

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

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

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

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

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

This means that if a name has been properly proposed in the past, it is used. This is exactly what happens in this paper for four different taxa referred to within.

Alternatively, if no name is available, one is proposed according to the rules of the Code as is done six times in this paper.

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

The published literature relevant to *Boiga irregularis sensu lato* and the taxonomic and nomenclatural judgements made within this paper includes papers relevant to other Australian, New Guinea, East Indonesia and Pacific Island species affected by the same physical barriers to dispersion as well as those directly relevant to *Boiga*. Combined, this literature includes the following:

Adler, *et al.* (1995), Austin (2000), Austin *et al.* (2010), Balsai (1995), Barbour (1921), Bauer and Günther (2013), Bechstein (1802), Boulenger (1884, 1886, 1890, 1893), Bruns *et al.* (1989), Buden and Taborši (2016), Buden *et al.* (2001, 2014), Cogger (1972, 2014), Cogger *et al.* (1983), Crotty and Jayne (2014), Dahl (1986), Daudin (1802), Daza *et al.* (2015), de Rooij (1917), Duméril and Bibron (1839, 1844, 1854), Escoriza Boj (2005), Fischer (1884), Fritts and Rodda (1998), Fritts (1988), Gray

(1842, 1856), Greer (1982), Greer and Parker (1967), Groen (2008), Hagen *et al.* (2012), Hall (2002), Hoser (1980, 1989, 2012), ICZN (1986), in den Bosch (1985), Iskandar and Erdelen (2006), Jackson and Jackson (2010), Jackson and Perry (2000), Jacquinet and Guichenot (1853), Jordan and Rodda (1994), Keogh *et al.* (2003), Kinghorn (1928, 1937), Koch *et al.* (2009), Kraus (2015), Lardner *et al.* (2014), Longman (1915, 1918), Macleay (1877, 1884, 1888), Mason *et al.* (2011), Mathies and Miller (2003), Mathies *et al.* (2010), Mayer (2014), McCoid *et al.* (1994), McCoy (1980, 2006), McDiarmid *et al.* (1999), McDowell (1970), McFadden and Boylan (2014), Mys (1988), Ogilby (1890), Orlov and Ryabov (2002), Orlov *et al.* (2003), O'Shea (1996), Pianka and Vitt (2003), Pyron *et al.* (2013), Ramadhan *et al.* (2010), Reeder (2003), Richmond *et al.* (2014), Rodda and Fritts (1992), Rodda and Savidge (2007), Rodda *et al.* (1999), Russell and Coupe (1984), Schmidt (2012), Schmidt (1932), Setiadi and Hamidy (2006), Siers *et al.* (2014), Somaweera (2009), Switak (2006), Wanger *et al.* (2011), Wells and Wellington (1985), Werner (1899a, 1899b), Wilson and Swan (2010) and sources cited therein.

Some material within descriptions below is repeated for different described taxa and this is in accordance with the provisions of the *International Code of Zoological Nomenclature* and the legal requirements for each description. I make no apologies for this.

It should be noted that *Coluber irregularis* Bechstein, 1802 is the type species of the genus *Boiga*, Fitzinger. The name *Ibiba* Gray, 1825, as suppressed under the plenary powers in ICZN Opinion 1374, has been placed by the ICZN on the Official Index of Rejected and Invalid Generic Names in Zoology (ICZN 1986).

DESIGNATION OF A NEOTYPE FOR *BOIGA IRREGULARIS* (BECHSTEIN, 1802)

To remove potential confusion and instability in the taxonomy of this species group, a neotype for the snake originally described as *Coluber irregularis* Bechstein, 1802 is designated herein, in accordance with Article 75 of the current ICZN code (Ride *et al.* 1999)(as amended).

Cogger *et al.* (1983) determined that all type material and data had been lost.

They also detailed the relevant status of each of the holotypes of what they described as synonyms and these may or may not be treated by other authors as being of different taxa.

In accordance with Article 75.3 of the code it is herein noted that there is further potential for recognition of further species or subspecies within what is now identified as *Boiga irregularis* if and when further

collection of material within the relevant region is done.

As a result of these relevant factors and under Article 75.3.1 of the code the neotype is assigned to clarify the status of "typical" *B. irregularis*, as outlined by other herpetologists in the past (e.g. Rodda and Savidge 2007) to be a reference point for the taxon.

Under Article 75.3.2 of the code, I refer to the diagnosis of the species-group taxon *B. irregularis* on page 142 of Hoser (1989), being for the description of the "brick-red phase with some black markings is found east of Cape York and along the east coast." Also depicted in the images numbers 367 and 368 on the same page which form part of that description that being part of the description of the neotype herein.

Under Articles 75.3.3. and 75.3.7. of the ICZN code, I herein designate the neotype for *Coluber irregularis* Bechstein, 1802, now known as *Boiga irregularis* (Bechstein, 1802), as a specimen in the Australian Museum, Sydney, NSW, Australia, specimen no. R.8024, from Church Point, near West Head and Pittwater, NSW. Latitude -33.65, Longitude 151.28.

For a description of the neotype, refer to images numbers 367 and 368 on page 142 of Hoser (1989) for the snake's salient features, noting that as a preserved specimen, the relevant colouration is faded.

The Australian Museum in Sydney, NSW, Australia is a publicly

owned facility that allows access to its holdings.

The three relevant animals (neotype and those depicted in images numbers 367 and 368 on page 142 of Hoser (1989) all come from within or the boundary of Kurringai Chase National Park, in New South Wales, Australia and are of the same general form and appearance and relevant taxonomic features.

Under Article 75.3.4. I herein state that the original holotype specimen for *Coluber irregularis* Bechstein, 1802, has apparently been permanently lost and searches have been unable to locate it. Refer to the summary of relevant events on page 209 of Cogger *et al.* (1983).

Based on the original description of the holotype by Bechstein (1802), the neotype matches the same species within the description and may well be from the same regional location. Relevant to article 75.3.5 of the code, this detail has been corroborated by Rodda and Savidge (2007).

In accordance with Article 75.3.6 of the code, I note that the type locality of the original holotype is not known, other than obviously being the general region it could possibly come from (in or near Australia and most likely eastern Australia).

However the description of the holotype excludes outlier locations including island groups where congeneric snakes do not match the original species descriptions (refer again to Rodda and Savidge 2007).

BOIGA IRREGULARIS (BECHSTEIN, 1802).

Holotype: Lost. Neotype described above.

Diagnosis: The species *B. irregularis* and all subspecies described herein are separated from all other snakes by the following suite of characters:

The body shape is very slender, with a mass of about 100 g for an average 1,000-mm SVL individual. Colour is usually reddish, orange or brown or a combination of these, either patterned, unpatterned or indistinctly marked in varying configurations, sometimes taking on a whitish grey appearance prior to shedding skin. Scales or interstitial skin may be marked with black or other darker pigment, either in the form of blotches, flecks, scale edging or similar. Attains up to about 2 metres maximum length, with most non-growing adults about 1.2 metres.

Tail is more or less round in cross section and tapering to a point. There is a single loreal scale, a single row of enlarged ventral scales, numbering from 217-286, 17-23 dorsal mid-body rows, anal plate either single or divided, 65-130 all divided subcaudals, standard colubrid head shields, there are sometimes transversely enlarged middorsal scales, head shape is with a blunt short snout with wide quadrates (relative to neck) and large eyes with an elliptical pupil.

Distribution: Naturally occurs along the east and north coasts of Australia, stretching from north of Sydney Harbour, New South Wales to the Kimberly in Western Australia, New Guinea and nearby islands as far west as Sulawesi and offshore islands as far south east as Sudest (AKA Tagula Island), north-east as the Solomon Islands and including the Bismark Archipelago as well as Manus Island. Found also in Ambon, Ceram, Buru, Obi, Halmahera, Aru, Kar Kar and other islands near New Guinea. Introduced to Guam where it is a serious ecological pest. Has been found in Micronesia where it may also be introduced.

The various subspecies are defined and diagnosed below.

BOIGA IRREGULARIS IRREGULARIS (BECHSTEIN, 1802).

Holotype: Lost. Neotype described above.

Diagnosis: *Boiga irregularis irregularis* (Bechstein, 1802) from Eastern Australia, which includes *B. boydii* (Macleay, 1884), that has been synonymised herein is diagnosed and separated from all other subspecies by the following unique suite of characters: It is (in life) (in adults) reddish brown dorsally, with indistinct black speckling along the mid-dorsal line and to a lesser extent the sides. There is no obvious banding pattern and the tail lacks any obvious bands or pattern, being one colour and with just a

few indistinct flecks. There is little black pigment on the head save for scattered darkish blotches and rarely darker etching of the rear of one or two of the last two labials. The belly is a distinctive salmon colour.

Boiga irregularis fusca (Gray, 1842), from Northern Australia west of Cape York and with a type locality of Port Essington, Northern Territory is herein treated as including *B. ornata* (Macleay, 1888), with a type locality of Kings Sound, north-western Australia.

The subspecies *B. irregularis fusca* as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in adults) a distinctive dorsal pattern of alternating thick white and reddish cross-bands of roughly equal width. These bands continue along the tail and the darker bands become considerably wider, at the expense of the whitish ones as one moves towards the end of the tail. All specimens have the reddish bands narrow slightly on the lower flanks, but this is more distinctive in the NT specimens (conforming to *B. fusca*), whereas West Australian animals (which would otherwise be treated as *B. ornata*) have only slight narrowing of the darker bands on the lower flanks. The West Australian animals also tend to have reddish-orange bands as opposed to orange in the Northern Territory and Queensland animals and a stronger contrast between the white and darker bands, but in view of the likely continuum of the populations across the north-west of the NT and nearby WA including throughout the Victoria River region, I do not herein treat them as subspecifically distinct from one another.

Boiga irregularis laticeps (Macleay, 1877) from south-east New Guinea, which includes *B. fravigastra* (Macleay, 1877), that has been synonymised herein, is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in life) (in adults) a distinct blackish-brown temporal streak and similar thick dark etching of the rear upper labials. The top of the head is generally unmarked except for scattered and indistinct peppering. The snout, upper labials and chinshields are creamish to white. Belly is creamish white and the body is generally unpatterned, but with scattered dark flecks. The tail has indistinct blackish and brownish bands.

Boiga irregularis flavescens (Duméril *et al.* 1854) from Sulawesi as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in life) (in adults) a thick dark brown temporal streak running from the lower eye to the back of the head. It does not extend anterior to the eye. There is no dark pigment on the anterior of the head and no obvious dark etching or barring of the upper labials. Dorsally the colour is reddish brown with darkish bands running in a jagged manner across the back. At the mid-dorsal line, these darken to become nearly black and fade to merge with the lighter background on the lower flanks. On the main part of the body, the lighter cross bands are twice as wide as the darker ones. There are no black spots, flecks or markings anywhere on the sides or flanks of the snake, or if so (in some specimens only), they are only continuation of those from the mid-dorsal ridge and do not go beyond the mid flanks. The tail has distinct thick black bands, separated by lighter reddish brown bands of half the thickness. Venter is yellowish brown and immaculate.

Boiga irregularis halmaheraensis subsp. nov. as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in life) (in adults) a thick dark brown temporal streak running from the lower eye to the back of the head and in that it extends anterior to the eye to the nostril, although it is a thinner and less distinct streak anterior to the eye. Colouration in the anterior part of the body is a distinctive combination of bands being beige and yellow in colour.

The interstitial skin in the middle of the beige scales is black, significantly altering the appearance to give the impression of

the snake's colouration at forebody being a three coloured series of bands. The mid and lower body is essentially a light beigeish-brown colour all over and with scattered black tipped scales giving the snake a flecked appearance. The tail is yellowish brown with black peppering.

Boiga irregularis roddai subsp. nov. from North New Guinea, Manus Island, other nearby islands and accidentally introduced onto the island of Guam is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life, it is characterised by a distinctively light orangeish colouration throughout and a general lack of dark patches or pigment on the head. The body is effectively unpatterned, being an orangeish colour, sometimes broken with a small number of dark flecks. These are scattered dark patches within individual scales, usually not consisting of the whole scale, parts of which remain the orange background colour (usually the outer parts of each scale).

The tail is plain orange with no flecks, banding or other markings. Sometimes the rear upper labials have a dark orange etching. The venter is an immaculate yellowish brown, although in some specimens the edges of each scale are a thickened yellow.

Boiga irregularis buruensis subsp. nov. is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life, other than peppering of scales on the head near the eye (see below), there is no obvious black pigment on the upper body (readily separating this taxon from *B. irregularis irregularis* and *sudestensis subsp. nov.*). The body is an indistinct pattern of dark grey patches on a yellowish-brown background. On the head, there is peppering on the scales running in a line laterally through the eye and near to the eye (both front and back of it) (not seen in *B. irregularis irregularis* and *sudestensis subsp. nov.*).

B. irregularis irregularis lacks obvious temporal markings and *B. sudestensis subsp. nov.* has a distinct but faint temporal streak, but no darkening in front of the eye.

In *Boiga irregularis buruensis subsp. nov.* there is no distinct temporal streak running behind the eye as seen in some of the other subspecies described herein. Other than the grayish peppering near the eye (both front and back of it only) and a large patch of dark grey around the frontal shield (which may fade in old specimens), the rest of the head is distinctly yellow, including the upper labials and the lower labials and chin, giving this taxon a similar appearance to *B. irregularis sudestensis subsp. nov.* as described herein.

Boiga irregularis sudestensis subsp. nov. as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life, it is similar in most respects to *B. irregularis irregularis* as defined above, from which it is separated by having distinct yellowing of the upper labials and rear of the skull and an immaculate yellow belly and distinct but faint temporal streak running behind the eye. There is also less black pigment on the body than on Australian specimens of *B. irregularis irregularis*.

Boiga irregularis solomonensis subsp. nov. is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults (in life), the dorsal pattern is a combination of broken black dorsal cross-bands alternating with thinner brownish-yellow bands. On the sides of the ventrals, these reverse with there being a black rectangular blotch on every second scale, or sometimes every third scale, and the in between ones being immaculate yellowish-white.

The venter itself is also an immaculate yellowish-white. This gives the appearance of two broken black lines running down either side of the belly.

The head is characterized by a dark temporal streak on either side and thick dark lines running across the labials at the rear of the eye, running from the lip upwards, either to or very near the dark temporal streak. The top of the head is often covered with

darker pigment and at least always includes blackish spots or markings on the parietals. The tail is either darkish black or banded.

Boiga irregularis newbritainensis subsp. nov. is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life it is generally orange in dorsal colour with well-defined but indistinct crossbands of similar colour.

There is a general lack of black pigment throughout. The chin shields and lower labials are mainly white, or occasionally some or more may be yellowish. The iris is slightly bluish in colour in contrast to all other subspecies.

The fore-belly is yellow, posterior belly whitish and all is peppered. The posterior rims of each ventral is darkened, being generally greyish on the neck, then yellowish anteriorly and reddish posteriorly.

There is a general lack of white on the upper head (including the upper labials), this being in contrast to most other subspecies which have a very noticeable whitening of the upper labials. There is a slight, but noticeable dark orange etching of the rear upper labials.

Distribution: East of Cape York Australia, from the tip of Cape York to the North Shore of Sydney, New South Wales.

***BOIGA IRREGULARIS FUSCA* (GRAY, 1842).**

Holotype: A specimen at the Museum of Natural History, London, UK, specimen number: 1946.1.1.28 from Port Essington, Northern Territory, Australia.

Diagnosis: *Boiga irregularis fusca* (Gray, 1842), from Northern Australia west of Cape York and with a type locality of Port Essington, Northern Territory is herein treated as including *B. ornata* (Macleay, 1888), with a type locality of Kings Sound, north-western Australia.

The subspecies as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in adults) a distinctive dorsal pattern of alternating thick white and reddish cross-bands of roughly equal width. These bands continue along the tail and the darker bands become considerably longer (at the expense of the whitish ones as one moves towards the end of the tail. All specimens have the reddish bands narrow slightly on the lower flanks, but this is more distinctive in the NT specimens (conforming to *B. fusca*), whereas West Australian animals (which would otherwise be treated as *B. ornata*) have only slight narrowing of the darker bands on the lower flanks. The West Australian animals also tend to have reddish-orange bands as opposed to orange in the NT animals and a stronger contrast between the white and darker bands, but in view of the likely continuum of the populations across the north-west of the NT and nearby WA, I do not herein treat them as subspecifically distinct from one another.

Distribution: Northern Australia from west of Cape York, on the Gulf of Carpentaria, Queensland, across the tropical rim of northern Australia, through the Northern Territory into the north-west of Australia, in the Kimberley division.

***BOIGA IRREGULARIS LATICEPS* (MACLEAY, 1877).**

Syntypes: Specimens at the Australian Museum, Sydney, NSW, Australia, specimen numbers: R3188, 3189, 3190 and 3191 from Hall Sound, Papua New Guinea.

Diagnosis: *Boiga irregularis laticeps* (Macleay, 1877) from south-east New Guinea, which includes *B. fravigastra* (Macleay, 1877), that has been synonymised herein is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in life) (in adults) a distinct blackish-brown temporal streak and similar thick dark etching of the rear upper labials; the top of the head is generally unmarked except for scattered and indistinct peppering. The snout, upper labials and chinshields are creamish to white. Belly is creamish white and the body is

generally unpatterned, but with scattered dark flecks. The tail has indistinct blackish and brownish bands.

Distribution: Southern New Guinea in a region east of the Fly River basin.

***BOIGA IRREGULARIS FLAVESCENS* (DUMÉRIL, BIBRON AND DUMÉRIL, 1854).**

Type locality: Sulawesi, Indonesia.

Diagnosis: *Boiga irregularis flavescens* (Duméril *et al.* 1854) from Sulawesi as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in life) (in adults) a thick dark brown temporal streak running from the lower eye to the back of the head. It does not extend anterior to the eye. There is no dark pigment on the anterior of the head and no obvious dark etching or barring of the upper labials. Dorsally the colour is reddish brown with darkish bands running in a jagged manner across the back (being very strong in juveniles). At the mid-dorsal line, these darken to become nearly black and fade to merge with the lighter background on the lower flanks. On the main part of the body, the lighter cross bands are twice as wide as the darker ones. There are no black spots, flecks or markings anywhere on the sides or flanks of the snake, or if so (in some specimens only), they are only continuation of those from the mid-dorsal ridge and do not go beyond the mid flanks. The tail has distinct thick black bands, separated by lighter reddish brown bands of half the thickness. Venter is yellowish brown and immaculate.

Distribution: Sulawesi (Indonesia) and immediately adjacent islands.

***BOIGA IRREGULARIS HALMAHERAENSIS* SUBSP. NOV.**

Holotype: A specimen at the US National Museum (USNM), now called the Smithsonian National Museum of Natural History, Washington, DC, USA, specimen number: 215938.6335071 collected at Kampung Loleba, Wasile District, Moluccas, Indonesia.

This is a facility that allows access to its holdings.

Paratypes: Three specimens at the US National Museum (USNM), now called the Smithsonian National Museum of Natural History, Washington, DC, USA, specimen numbers: 215937.6335070, 215939.6335072 and 215945.6335078 collected at Kampung Loleba, Wasile District, Moluccas, Indonesia.

Diagnosis: *Boiga irregularis halmaheraensis* subsp. nov. as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in life) (in adults) a thick dark brown temporal streak running from the lower eye to the back of the head and in that it extends anterior to the eye to the nostril, although it is a thinner and less distinct streak anterior to the eye. Colouration in the anterior part of the body is a distinctive combination of bands being beige and yellow in colour. The interstitial skin in the middle of the beige scales is black, significantly altering the appearance to give the impression of the snake's colouration at forebody being a three coloured series of bands. The mid and lower body is essentially a light beige-brown colour all over and with scattered black tipped scales giving the snake a flecked appearance. The tail is yellowish brown with black peppering.

For separation of all other subspecies see for *Boiga irregularis irregularis* as detailed within this paper.

Distribution: Halmahera Island, Indonesia and immediately adjacent smaller islands.

Etymology: Named in reflection of where the taxon comes from.

***BOIGA IRREGULARIS RODDAI* SUBSP. NOV.**

Holotype: A specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R.130423.001 collected at Polomou DPI Station, Manus Island, Admiralty Islands, Manus District, Papua New Guinea (PNG) Lat. 2°07'S, Long. 147°05'E.

The Australian Museum, Sydney, NSW, Australia, is a government owned facility that allows access to its holdings.

Paratype: A specimen at the Australian Museum, Sydney, NSW, Australia, specimen number: R.129052 collected at Los Negros Island, Admiralty Islands, Manus District, PNG, Lat. 2°01'S, Long. 147°25'E.

Diagnosis: *Boiga irregularis roddai subsp. nov.* from North New Guinea, Manus Island, other nearby islands and accidentally introduced onto the island of Guam is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life, it is characterised by a distinctively light orangeish colouration throughout and a general lack of dark patches or pigment on the head. The body is effectively unpatterned, being an orangeish colour, sometimes broken with a very small number of dark flecks. These are scattered dark patches within individual scales, usually not consisting of the whole scale, parts of which remain the orange background colour (usually the outer parts of each scale).

The tail is plain orange with no flecks, banding or other markings. Sometimes the rear upper labials have a dark orange etching. The venter is an immaculate yellowish brown, lightening to whitish at the rear in some specimens. In some specimens the edges of each ventral scale are a thickened yellow.

For separation of all other subspecies see for *Boiga irregularis irregularis* as detailed within this paper.

Distribution: Northern New Guinea, generally west of the Huon Peninsula and north of the central cordillera, as well as islands to the north including Kar Kar, the Admiralty Islands and more recently accidentally introduced to Guam.

Etymology: Named after Gordon Rodda of the United States Geological Service (USGS) in recognition of his work studying the effects of this invasive subspecies of snake.

BOIGA IRREGULARIS BURUENSIS SUBSP. NOV.

Holotype: A specimen at the Staatliches Museum für Naturkunde, Stuttgart, Germany, (SMNS), specimen number: Herpetologie:2718, collected at Buru Island, Indonesia.

This is a facility that allows access to its holdings.

Diagnosis: *Boiga irregularis buruensis subsp. nov.* is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life, other than peppering of scales on the head near the eye (see below), there is no obvious black pigment on the upper body (readily separating this taxon from *B. irregularis irregularis* and *sudestensis subsp. nov.*). The body is an indistinct pattern of dark grey patches on a yellowish-brown background. On the head, there is peppering on the scales running in a line laterally through the eye and near to the eye (both front and back of it) (not seen in *B. irregularis irregularis* and *sudestensis sp. nov.*).

B. irregularis irregularis lacks obvious temporal markings and *B. sudestensis subsp. nov.* has a distinct but faint temporal streak, but no darkening in front of the eye.

In *Boiga irregularis buruensis subsp. nov.* there is no distinct temporal streak running behind the eye as seen in some of the other subspecies described herein. Other than the grayish peppering near the eye (both front and back of it only and distinct for this subspecies) and a large patch of dark grey around the frontal shield (which may fade in old specimens), the rest of the head is distinctly yellow, including the upper labials and the lower labials and chin, giving this taxon a similar appearance to *B. irregularis sudestensis sp. nov.* as described herein.

Boiga irregularis sudestensis subsp. nov. as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life, it is similar in most respects to *B. irregularis irregularis* as defined above, from which it is separated by having distinct yellowing of the upper labials and rear of the skull and an immaculate yellow belly and distinct but faint temporal streak running behind the

eye. There is also less black pigment on the body than on Australian specimens of *B. irregularis irregularis*.

For separation of all other subspecies see for *Boiga irregularis irregularis* as detailed within this paper.

Distribution: Buru Island as well as Ambon, Ceram and Obi, Indonesia.

Etymology: Named after the location the holotype originates.

BOIGA IRREGULARIS SUDESTENSIS SUBSP. NOV.

Holotype: A specimen at the Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA, specimen number: BPBM 20790 collected at Mt. Rio, oxbow along Gesirava River upstream from "Camp 1", "Point 9", Sudest Island. Lat. -11°49', Longitude 153°42', Milne Bay Province, Papua New Guinea. The Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA is a facility that allows access to its holdings.

Diagnosis: *Boiga irregularis sudestensis subsp. nov.* as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life, it is similar in most respects to *B. irregularis irregularis* as defined above, from which it is separated by having distinct yellowing of the upper labials and rear of the skull and an immaculate yellow belly and distinct but faint temporal streak running behind the eye. There is also less black pigment on the body than on Australian specimens of *B. irregularis irregularis*.

Boiga irregularis irregularis (Bechstein, 1802) from Eastern Australia, which includes *B. boydii* (Macleay, 1884), that has been synonymised herein is diagnosed and separated from all other subspecies by the following unique suite of characters: It is (in life) (in adults) reddish brown dorsally, with indistinct black speckling along the mid-dorsal line and to a lesser extent the sides. There is no obvious banding pattern and the tail lacks any obvious bands or pattern, being one colour and with just a few indistinct flecks. There is little black pigment on the head save for scattered darkish blotches and rarely darker etching of the rear of one or two of the last two labials. The belly is a distinctive salmon colour.

Boiga irregularis fusca (Gray, 1842), from Northern Australia west of Cape York and with a type locality of Port Essington, Northern Territory is herein treated as including *B. ornata* (Macleay, 1888), with a type locality of Kings Sound, north-western Australia.

The subspecies as herein defined is diagnosed and separated from all other subspecies by the following unique suite of characters: It is the only subspecies with (in adults) a distinctive dorsal pattern of alternating thick white and reddish cross-bands of roughly equal width. These bands continue along the tail and the darker bands become considerably longer (at the expense of the whitish ones as one moves towards the end of the tail. All specimens have the reddish bands narrow slightly on the lower flanks, but this is more distinctive in the NT specimens (conforming to *B. fusca*), whereas West Australian animals (which would otherwise be treated as *B. ornata*) have only slight narrowing of the darker bands on the lower flanks. The West Australian animals also tend to have reddish-orange bands as opposed to orange in the NT animals and a stronger contrast between the white and darker bands, but in view of the likely continuum of the populations across the north-west of the NT and nearby WA, I do not herein treat them as subspecifically distinct from one another.

For separation of all other subspecies see for *Boiga irregularis irregularis* as detailed within this paper.

Distribution: Sudest (AKA Tagula Island), Milne Bay Province, Papua New Guinea.

Etymology: Named after where the subspecies is known from.

BOIGA IRREGULARIS SOLOMONENSIS SUBSP. NOV.

Holotype: A specimen at the Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA, specimen number: BPBM 18200 collected at Mt. Austen, Guadalcanal Island, Solomon Islands.

The Bernice Pauahi Bishop Museum is a facility that allows access to its holdings.

Paratype: A specimen at the Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA, specimen number: BPBM 3311 collected at Nini Creek, Roroni, Guadalcanal Island, Solomon Islands.

Diagnosis: *Boiga irregularis solomonensis* subsp. nov. is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults (in life), the dorsal pattern is a combination of broken black dorsal cross-bands alternating with thinner brownish-yellow bands. On the sides of the ventrals, these reverse with there being a black rectangular blotch on every second scale, or sometimes every third scale, and the in between ones being immaculate yellowish-white. The venter itself is also an immaculate yellowish-white. This gives the appearance of two broken black lines running down either side of the belly.

The head is characterized by a dark temporal streak on either side and thick dark lines running across the labials at the rear of the eye, running from the lip upwards, either to or very near the dark temporal streak. The top of the head is often covered with darker pigment and at least always includes blackish spots or markings on the parietals. The tail is either darkish black or banded.

For separation of all other subspecies see for *Boiga irregularis irregularis* as detailed within this paper.

Dsitribution: The Solomon Islands. It should be noted that there is a strong argument to futher split the Solomon Islands populations based on consistent colouration differences between some of the main islands.

Etymology: **Named after where the subspecies is known from.**

BOIGA IRREGULARIS NEWBRITAINENSIS SUBSP. NOV.

Holotype: A specimen at the Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA, specimen number: BPBM 22548 collected 9 km NNW of Marmar, New Britain Island, Papua New Guinea.

The Bernice Pauahi Bishop Museum is a facility that allows access to its holdings.

Paratypes: 1/ A specimen at the Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA, specimen number: BPBM 22549 collected 9 km NNW of Marmar, New Britain Island, Papua New Guinea.

2/ A specimen at the Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA, specimen number: BPBM 22550 collected 9.2 km NNW of Marmar, New Britain Island, Papua New Guinea.

3/ A specimen at the Bernice Pauahi Bishop Museum, Honolulu, Hawaii, USA, specimen number: BPBM 22551 collected 2.5 km NNW of Marmar, New Britain Island, Papua New Guinea.

Diagnosis: *Boiga irregularis newbritainensis* subsp. nov. is diagnosed and separated from all other subspecies by the following unique suite of characters: In adults in life it is generally orange in dorsal colour with well-defined but indistinct crossbands of similar colour.

There is a general lack of black pigment throughout. The chin shields and lower labials are mainly white, or occasionally some or more may be yellowish. The iris is slightly bluish in colour in contrast to all other subspecies.

The fore-belly is yellow, posterior belly whitish and all is peppered. The posterior rims of each ventral is darkened, being generally greyish on the neck, then yellowish anteriorly and reddish posteriorly.

There is a general lack of white on the upper head (including the upper labials), this being in contrast to most other subspecies which have a very noticeable whitening of the upper labials.

There is a slight, but noticeable dark orange etching of the rear upper labials.

For separation of all other subspecies see for *Boiga irregularis irregularis* as detailed within this paper.

Distribution: New Britain and immediately adjacent islands in the Bismark Archipelago.

Etymology: Named after the location the holotype originated from.

NOTES ON THE DESCRIPTIONS FOR ANY POTENTIAL REVISORS

Unless mandated by the rules of the *International Code of Zoological Nomenclature*, none of the spellings of the newly proposed names should be altered in any way. Should one or more newly named taxa be merged by later authors to be treated as a single subspecies, the order of priority of retention of names should be the order (page priority) of the descriptions within this text.

REFERENCES CITED

- Adler, G. H., Austin, C. C. and Dudley, R. 1995. Dispersal and speciation of skinks among archipelagos in the tropical Pacific Ocean. *Evolutionary Ecology* 9:529-541.
- Austin, C. C. 2000. Molecular phylogeny and historical biogeography of Pacific Island boas (*Candoia*). *Copeia* 2000(2):341-352.
- Austin, C. C., Rittmeyer, E. N., Richards, S. J. and Zug, G. R. 2010. Phylogeny, historical biogeography and body size evolution in Pacific Island Crocodile skinks *Tribolonotus* (Squamata; Scincidae). *Molecular Phylogenetics and Evolution* 57(1):227-236.
- Balsai, M. J. 1995. Husbandry and Breeding of the Solomon Islands Prehensile-tailed Skink, *Corucia zebrata*. *The Vivarium* 7(1):4-11.
- Barbour, T. 1921. Reptiles and amphibians from the British Solomon Islands. *Proc. New England zool. Club* 7:91-112.
- Bauer, A. M. and Günther, R. 2013. Origin and identity of the von Borcke collection of amphibians and reptiles in the Museum für Naturkunde in Berlin: A cache of Seba specimens? *Zoosystematics and Evolution* 89(1):167-185.
- Bechstein, J. M. 1802. Herrn de Lacépède's Naturgeschichte der Amphibien oder der eyerlegenden vierfüßigen Thiere und der Schlangen. *Eine Fortsetzung von Buffon's Naturgeschichte aus dem Französischen übersetzt und mit Anmerkungen und Zusätzen versehen*. Weimar: Industrie Comptoir.
- Boulenger, G. A. 1884. Diagnoses of new reptiles and batrachians from the Solomon Islands, collected and presented to the British Museum by H. B. Guppy, Esq., M. B., H. M. S. 'Lark.'. *Proc. Zool. Soc. London* 1884:210-213.
- Boulenger, G. A. 1886. On the reptiles and batrachians of the Solomon Islands. *Trans. Zool. Soc. London* 12:35-62.
- Boulenger, G. A. 1890. Fourth contribution to the herpetology of the Solomon Islands. *Proc. Zool. Soc. London* 1890:30-31.
- Boulenger, G. A. 1893. *Catalogue of the snakes in the British Museum (Nat. Hist.) I*. London (Taylor and Francis):448 pp.
- Bruns, T. R., Vedder, J. R. and Cooper, A. K. 1989. Geology of the Shortland Basin Region, Central Solomons Trough, Solomon Islands - Review and New Findings. pp. 125-144 in Vedder, J.G., and Bruns, T. R., (editors), 1989. Geology and offshore resources of Pacific island arcs Solomon Islands and Bougainville, Papua New Guinea Regions: Houston, Texas, Circum-Pacific Council for Energy and Mineral Resources, Earth Science Series, v. 12.
- Buden, D. W. and Taboroši, D. 2016. *Reptiles of the Federated States of Micronesia*. Island Research and Education Initiative:311 pp.
- Buden, D. W., Lynch, D. B. and Zug, G. R. 2001. Recent records of exotic reptiles on Pohnpei, Eastern Caroline Islands, Micronesia. *Pacific Science* 55(1):65-70.
- Buden, D. W., de Queiroz, K., Van Rooijen, J., Stinson, D. W., Wiles, G. J. and Robert, S. 2014. New Information and

- Reappraisals Concerning Some Alien and Indigenous Snake Records from the Federated States of Micronesia and the Mariana Islands. *Pacific Science* Apr 2014, 68(2):287-293.
- Cogger, H. G. 1972. A new scincid lizard of the genus *Tribolonotus* from Manus Island, New Guinea. *Zool. Mededelingen* 47:202-210.
- Cogger, H. G. 2014. *Reptiles and Amphibians of Australia*. 7th ed. CSIRO Publishing, Australia:xxx+1033 pp.
- 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:313 pp.
- Court of Appeal Victoria 2014. Hoser v Department of Sustainability and Environment [2014] VSCA 206 (5 September 2014).
- Crotty, T. L. and Jayne, B. C. 2014. Trade-offs between eating and moving: what happens to the locomotion of slender arboreal snakes when they eat big prey? *Biological Journal of the Linnean Society* 114(2):446-458.
- Dahl, A. L. 1986. *Review of the protected areas system in Oceania*. IUCN/UNEP, Gland, Switzerland.
- Daudin, F. M. 1802. *Histoire Naturelle, Générale et Particulière des Reptiles*. Vol. 4. F. Dufart, Paris.
- Daza, J. D., Bauer, A. M., Sand, C., Lilley, I., Wake, T. A. and Valentin, F. 2015. Reptile Remains from Tiga (Tokanod), Loyalty Islands, New Caledonia. *Pacific Science* Oct 2015, 69(4):531-557.
- de Rooij, N. 1917. *The Reptiles of the Indo-Australian Archipelago. II. Ophidia*. Leiden (E. J. Brill), xiv+334 S.
- Duméril, A. M. C. and Bibron, G. 1839. *Erpétologie Générale on Histoire Naturelle Complète des Reptiles*. Vol.5. Roret/Fain et Thunot, Paris:871 pp.
- Duméril, A. M. C. and Bibron, G. 1844. *Erpétologie Générale ou Histoire Naturelle Complète des Reptiles*. Vol.6. Libr. Encyclopédique Roret, Paris, 609 pp.
- Duméril, A. M. C., Bibron, G. and Duméril, A. H. A. 1854. *Erpétologie générale ou histoire naturelle complète des reptiles. Tome septième. Deuxième partie, comprenant l'histoire des serpents venimeux*. Paris, Librairie Encyclopédique de Roret: i-xii+781-1536.
- Escoriza Boj, D. 2005. Australia. Reptiles and Amphibians, Part 1: Rainforest. *Reptilia* (GB)(40):70-75.
- Even, E. 2009. Neuer Nachweis für drei Schlangenarten für die Togian-Inseln, Sulawesi. *Elaphe* 17(1):56-59.
- Fischer, J. G. 1884. Herpetologische Bemerkungen. *Abh. Nat. Ver. Hamburg* 8(2):43-51 (3-11).
- Fritts T. H. and Rodda, G. H. 1998. The role of introduced species in the degradation of island ecosystems: a case history of Guam. *Annual Review of Ecology and Systematics*, 29:113-140.
- Fritts, T. H. 1988. The brown tree snake, *Boiga irregularis*, a threat to Pacific islands. *Fish and Wildl. Serv., U.S. Dept. of the Interior, Wash., D.C., Biol. Rept.* 88-31:36 pp.
- Gray, J. E. 1842. Description of some hitherto unrecorded species of Australian reptiles and batrachians. *Zoological Miscellany* 2:51-57 (London: Treuttel, Würtz and Co).
- Gray, J. E. 1856. New genus of fish-scaled lizards (Scissosaræ) from New Guinea. *Ann. Mag. Nat. Hist.* (2)18:345-346.
- Greer, A. E. 1982. A new species of *Geomyersia* (Scincidae) from the Admiralty Islands, with a summary of the genus. *Journal of Herpetology* 16(1):61-66.
- Greer, A. E. and Parker, F. 1967. A new scincid lizard from the northern Solomon Islands. *Breviora* (275):1-20.
- Groen, J. 2008. Het *Boiga*-genus. *Lacerta* 66(1-3):64-79.
- Hagen, I. J., Donnellan, S. C. and Bull, M. 2012. Phylogeography of the prehensile-tailed skink *Corucia zebrata* on the Solomon Archipelago. *Ecology and Evolution* (2012), 2(6):1220-1234.
- Hall, R., 2002. Cenozoic geological and plate tectonic evolution of SE Asia and the SW Pacific: computer-based reconstructions, model and animations. *J. Asian Earth Sci.* 20:353-431.
- Hoser, R. T. 1980. Further records of aggregations of various species of Australian snakes. *Herpetofauna* (Australia) 12:16-22.
- Hoser, R. T. 1989. *Australian Reptiles and Frogs*. Pierson and Co., Mosman, NSW, 2088, Australia: 238 pp.
- Hoser, R. T. 2002. Divisions of the Asian Colubrid snake genera *Xenochrophis*, *Dendrelaphis* and *Boiga* (Serpentes: Colubridae). *Australasian Journal of Herpetology* 12:65-76.
- ICZN 1986. Opinion 1374: *Boiga* Fitzinger. 1826 (Reptilia, serpentes): Conserved. *Bull. zool. Nom.* 43(1):2404.
- in den Bosch, H. A. J. 1985. Snakes of Sulawesi: checklist, key and additional biogeographical remarks. *Zoologische Verhandelingen* 217:3-50.
- Iskandar, D. T. and Erdelen, W. R. 2006. Conservation of amphibians and reptiles in Indonesia: issues and problems. *Amphibian and Reptile Conservation* 4(1):60-87.
- Jackson, A. and Jackson, K. 2010. Ecological and phylogenetic influences on maxillary dentition in snakes. *Phyllomedusa* 9(2):121-131.
- Jackson, K. and Perry, G. 2000. Changes in intestinal morphology following feeding in the Brown Treesnake, *Boiga irregularis*. *Journal of Herpetology* 34(3):459-462.
- Jacquinet, H. and Guichenot, A. 1853. Reptiles et poissons. In: Hombron and Jacquinet, *Zoologie 3, in: Dumont d'Urville, Voyage au Pole Sud et dans l'Oranie sur les corvettes "l'Astrolabe" et "la Zélée", ...* Gide and J. Baudry, Paris:56 pp.
- Jordan, M. A. and Rodda, G. H. 1994. Identification of sex in *Boiga irregularis*: Implications for understanding population dynamics in Guam. *Journal of Herpetology* 28(3):381-384.
- Keogh, S. J., Scott, A. W., Fitzgerald, M. and Shine, R. 2003. Molecular phylogeny of the Australian venomous snake genus *Hoplocephalus* (Serpentes, Elapidae) and conservation genetics of the threatened *H. stephensii*. *Conservation Genetics* 4:57-65.
- Kinghorn, J. R. 1928. Herpetology of the Solomon Islands. *Rec. Austral. Mus.* 16:123-178.
- Kinghorn, J. R. 1937. A new species of skink from the Solomon Islands. *Records of the Australian Museum* 20(1):1-2.
- Koch, A., Evy, A., Riyanto, A. and Böhme, W. 2009. Islands between the realms: A revised checklist of the herpetofauna of the Talaud archipelago, Indonesia, with a discussion about its biogeographic affinities. *Bonner zoologische Beiträge* 56(1/2):107-129 [2007].
- Kraus, F. 2015. Impacts from Invasive Reptiles and Amphibians. *Annual Review of Ecology, Evolution, and Systematics* 46:75-97.
- Lardner, B., Savidge, J. A., Reed, R. N. and Rodda, G. H. 2014. Movements and Activity of Juvenile Brown Treesnakes (*Boiga irregularis*). *Copeia* Sep 2014, 14(3):428-436.
- Longman, H. A. 1915. Reptiles from Queensland and the Northern Territory. *Memoirs of the Queensland Museum* 3:30-34.
- Longman, H. A. 1918. Notes on some Queensland and Papuan reptiles. *Memoirs of the Queensland Museum* 6: 37-44.
- Macleay, W. 1877. The ophidians of the Chevert Expedition. *Proceedings of the Linnean Society of New South Wales*, 2:33-41.
- Macleay, W. 1884. Census of Australian snakes with descriptions of two new species. *Proc. Linn. Soc. New South Wales* 9: 548-568.
- Macleay, W. 1888. Notes on some ophidians from King's Sound, north-west Australia. *Proc. Linn. Soc. New South Wales* (2)3:416-418.

- Mason, L. C., Savidge, J. A., Rodda, G. H. and Yackel Adams, A. A. 2011. Scented Guide Ropes as a Method to Enhance Brown Treesnake (*Boiga irregularis*) Trap Capture Success on Guam. *Journal of Herpetology* 45(3):308-312.
- Mathies, T. and Miller, L. A. 2003. Cool temperatures elicit reproduction in the biologically invasive predator, the Brown Treesnake (*Boiga irregularis*). *Zoo Biol.* 22:227-238.
- Mathies, T., Cruz, J. A., Lance, V. A. and Savidge, J. A. 2010. Reproductive Biology of Male Brown Treesnakes (*Boiga irregularis*) on Guam. *Journal of Herpetology* 44(2):209-221.
- Mayer, M. 2014. Von Schlangen, Kröten und Krokodilen im tropischen "Top End" Australiens. Ein Reise- und Studienbericht. *Reptilia* (Münster) 19(110):76-85.
- McCoid, M. J., Fritts, T. H. and Campbell, E. W. 1994. A Brown Tree Snake (Colubridae: *Boiga Irregularis*) Sighting in Texas. *Texas Journal of Science* 46(4):365-368.
- McCoy, M. 1980. *Reptiles of the Solomon Islands*. Wau Ecology Institute Handbook 7. Wau Ecology Institute, Wau, Papua New Guinea.
- McCoy, M. 2006. *Reptiles of the Solomon Islands*. Pensoft Series Faunistica 57:212 pp.
- McDiarmid, R. W., Campbell, J. A. and Touré, T. A. 1999. *Snake species of the world*. Vol. 1. Herpetologists' League:511 pp.
- McDowell, S. B. 1970. On the status and relationships of the Solomon Island elapid snakes. *Journal of Zoology*, London 161:145-190.
- McFadden, M. and Boylan, T. 2014. *Boiga irregularis* (brown tree snake) captive reproduction and longevity. *Herpetological Review* 45(1):60-61.
- Mys, B. 1988. The zoogeography of the scincid lizards from North Papua New Guinea (Reptilia: Scincidae). I. The distribution of the species. *Bull. Inst. Roy. Sci. Nat. Belgique (Biologie)* 58:127-183.
- Ogilby, J. D. 1890. Report on a zoological collection from the Solomon Islands. Part 2. *Rec. Austr. Mus.* 1:5-7.
- Orlov, N. L. and Ryabov, S. A. 2002. A new species of the genus *Boiga* (Serpentes, Colubridae, Colubrinae) from Tanahjampea Island and description of "black form" of *Boiga cynodon* complex from Sumatra (Indonesia). *Russ. J. Herpetol.* 9(1):33-56.
- Orlov, N. L., Kudryavtzev, S.V., Ryabov, S. A. and Shumakov, O. V. 2003. A new species of genus *Boiga* (Serpentes: Colubridae: Colubrinae) and color atlas of Boigas from Bengkulu province (Sumatra, Indonesia). *Russ. J. Herpetol.* 10(1):31-52.
- O'Shea, M. 1996. *A Guide to the Snakes of Papua New Guinea*. Independent Publishing, Port Moresby, xii+239 pp.
- Pianka, E. R. and Vitt, L. J. 2003. *Lizards - Windows to the Evolution of Diversity*. University of California Press, Berkeley:347 pp.
- Pyron, R. A., Burbrink, F. T. and Wiens, J. J. 2013. A phylogeny and revised classification of Squamata, including 4161 species of lizards and snakes. *BMC Evolutionary Biology* 13:93.
- Ramadhan, G., Iskandar, D. T., and Subasri, D. R. 2010. A New Species of Cat Snake (Serpentes: Colubridae) Morphologically Similar to *Boiga cynodon* from the Nusa Tenggara Islands, Indonesia. *Asian Herpetological Research* 2010, 1(1): 22-30.
- Reeder, T. W. 2003. A phylogeny of the Australian *Sphenomorphus* group (Scincidae) and the phylogenetic placement of the crocodile skinks (*Tribolonotus*): Bayesian approaches to assessing congruence and obtaining confidence in maximum likelihood inferred relationships. *Molecular Phylogenetics and Evolution* 27:384-397.
- Richmond, J. Q., Wood, D. A., Stanford, J. W. and Fisher, R. N. 2014. Testing for multiple invasion routes and source populations for the invasive brown treesnake (*Boiga irregularis*) on Guam: implications for pest management. *Biological Invasions*. 19 June:13 pp.
- Ride, W. D. L. (ed.) et al. (on behalf of the International Commission on Zoological Nomenclature) 1999. *International code of Zoological Nomenclature* (Fourth edition). The Natural History Museum - Cromwell Road, London SW7 5BD, UK (also commonly cited as "The Rules", "Zoological Rules" or "ICZN 1999").
- Rodda, G. H. and Fritts, T. H. 1992. The Impact of the Introduction of the Colubrid Snake *Boiga irregularis* on Guams Lizards. *Journal of Herpetology* 26(2):166-174.
- Rodda, G. H. and Savidge, J. A. 2010. Biology and Impacts of Pacific Island Invasive Species. 2. *Boiga irregularis*, the Brown Tree Snake (Reptilia: Colubridae). *Pacific Science* (2007), 61(3):307-324.
- Rodda, G. H., Fritts, T. H., McCoid, M. J. and Campbell, E. W. III. 1999. An overview of the biology of the Brown Tree-snake, *Boiga irregularis*, a costly introduced pest on Pacific Islands. pp. 44-80 in Rodda, G. H., Sawai, Y., Chiszar, D. and Tanaka, H. (eds.), *Problem snake management: The Habu and the Brown Tree-snake*. Cornell University Press, Ithaca, New York.
- Russell, E. and Coupe, S. 1984. *The Macquarie World Illustrated Atlas*. Kevin Weldon, Macquarie Library, Chatswood, NSW, Australia:511 pp.
- Schmidt, D. 2012. Giftbisse von giftigen und "harmlosen" Schlangen. Teil 2. Terraria. *Elaphe* 2012(3):68-75.
- Schmidt, K. P. 1932. Reptiles and Amphibians from the Solomon Islands. *Field Mus. Nat. Hist. Zool. Ser.* 18(9):175-190.
- Setiadi, M. I. and Hamidy, A. 2006. *Jenis-Jenis Herpetofauna di Pulau Halmahera*. Kerjasama antara Pusat Studi Biodiversitas dan Konservasi Universitas Indonesia dan Museum Zoologicum Bogoriense, Puslit Biologi Lembaga Ilmu Pengetahuan Indonesia.
- Siers, S. R., Savidge, J. A. and Reed, R. N. 2014. Invasive Brown Treesnake Movements at Road Edges Indicate Road-Crossing Avoidance. *Journal of Herpetology* 48(4):500-505.
- Somaweera, R. 2009. *Snakes of Darwin*. Poster, University of Sydney.
- Switak, K. H. 2006. *Adventures in Green Python Country*. Natur und Tier Verlag (Münster):364 pp.
- VCAT 2015. *Hoser v Department of Environment, Land, Water and Planning* (Review and Regulation) [2015] VCAT 1147 (30 July 2015).
- Wanger, T. C., Motzke, I., Saleh, S. and Iskandar, D. T. 2011. The amphibians and reptiles of the Lore Lindu National Park area, Central Sulawesi, Indonesia. *Salamandra* 47(1):17-29.
- 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.
- Werner, F. 1899a. Beiträge zur Herpetologie der pacifischen Inselwelt und von Kleinasien. I. Bemerkungen über einige Reptilien aus Neu-Guinea und Polynisien. II. Über einige Reptilien und Batrachier aus Kleinasien. *Zool. Anz.* 22:371-375, 375-378.
- Werner, F. 1899b. Ueber Reptilien und Batrachier aus Togoland, Kamerun und Deutsch-Neu-Guinea grösstentheils aus dem k. Museum für Naturkunde in Berlin. *Verhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien* 49:132-157.
- Wilson, S. and Swan, G. 2010. *A complete guide to reptiles of Australia*, 3rd ed. New Holland, Chatswood, NSW, Australia:558 pp.

CONFLICT OF INTEREST

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