

## Two new subspecies of Frill-necked Lizards (Squamata: Sauria: Agamidae).

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### ABSTRACT

Geographical variants of the Frill-necked Lizard *Chlamydosaurus kingii* Gray, 1825 have been recognized for many years including within the pet trade in Europe and the USA. In spite of this, there has been no recognition of the various taxonomic units beyond the single described species.

Taking a conservative position, this paper reviews the monotypic genus and formally names two new subspecies, namely *Chlamydosaurus kingii pughae* subsp. nov. from New Guinea and *Chlamydosaurus kingii mickpughi* from eastern Queensland.

**Keywords:** Taxonomic revision; Frill-necked Lizard; new subspecies; *Chlamydosaurus kingii*; *pughae*; *mickpughi*.

### INTRODUCTION

One of the best known species of lizard in Australia is the Frill-necked Lizard *Chlamydosaurus kingii* Gray, 1825, even gracing the rear of the Australian 2 cent coin until it was removed from circulation in the 1990's.

Unlike any other Agamid in Australia, its name comes from the unusual large frill around its neck, which is rarely opened and usually sits unfolded against the lizard's upper body.

Adults get to about 75 cm in total length, although specimens in excess of 90 cm are reported.

The neck frill is supported by long spines of cartilage which are connected to the jaw bones. When the lizard is frightened, it gapes its mouth, exposing a bright pink or yellow lining; the frill flares out as well, displaying brighter scales, the color of which vary geographically, but in most populations are orange to red.

In common with several other Australian genera of Agamid, this species uses bipedal motion, running on its hind legs to flee potential predators. The motion has led to the name bicycle lizard being applied to it.

The frill-necked lizard is found mainly in the dry tropics regions of Australia and southern New Guinea.

In Australia it is found from Kimberley Region, Western Australia in an arc across the top of the Northern Territory south along the Queensland coast, although they are not commonly seen in the humid south-east.

While the lizard rests in trees, relying on camouflage for protection, they are rarely seen by people. However when they are active on the ground, this is when most are seen.

In other ways, these lizards are typical of the Agamid family.

They are opportunistic feeders, but mainly insectivorous and reproduce by laying eggs.

Males engage in combat and as a rule are larger than females.

There have been numerous published studies on these lizards or relevant to them, including those of Badger and Netherton (2002), Beddard (1905), Bonetti (2002), Boulenger (1885, 1889), Broom (1898), Cogger (2000), de Rooij (1915), Duméril and Bibron (1837), Escoriza Boj (2005), Garman (1901), Gray (1825, 1826), Günther and Kapisa (2003), Hauschild and Bosch (1997), Hörenberg (2004, 2008), Hoser (1989), Kent (1895), Macey et al. (2000), Manthey and Schuster (1999), Middleton et al. (1997), Reisinger (1995), Ujvari and Madsen (2008), Ujvari et al. (2007, 2008).

### THE TAXONOMIC POSITION OF THE SPECIES *C. KINGII*.

For a long time it's been known that specimens from coastal Queensland are smaller and greyer in colouration than the nominate form from north-west Australia.

Specimens from Island New Guinea, from the Western District of PNG and in the vicinity of Merauke, Irian Jaya are also smaller than the nominate form, but have colouration more in line with specimens from north-west Australia.

In the herpetological pet trade, dealers and keepers have for a long time distinguished the regional variants.

Wells and Wellington (1985) wrote: "We herein regard *C. kingii* as a species complex and recommend taxonomic and ecological investigation."

While they may in fact be correct, I have taken a conservative position and recognized the three most obviously divergent forms as subspecies.

The reason for the treatment of the three forms as subspecies is based on the reasoning that it is assumed the intergrade populations either may occur or may have occurred in the very recent geological past, even though at the present time there is no evidence of this.

A perusal of the databases for collection of specimen records of major Australian museums yields about 958 specimens in collections and accurate locality sight records.

Included in this database of records are so-called "wide" specimens as in either erroneous records, or those arising from lizards that have obviously been transported a long way by people.

This includes records from South Australia (either misidentified *Pogona* or similar species or "vagrants") and one record from Ambon, Indonesia for a specimen in a United States Museum.

Collection records cluster in three main regions. These are northwest Australia, including the top third of the Northern Territory and adjacent parts of the Kimberley Ranges in Western Australia. The relative scarcity of collection records for the region near the Gulf of Carpentaria probably reflects a lack of collecting as opposed to a lack of Frill-necked Lizards.

There is a well-defined gap in distribution (based on collection records) commencing from the south-west of Cape York and running south, which apparently splits the western and eastern populations of the species.

This gap may be real, or it may be a reflection of a lack of collection in the region. This uncertainty is why I have opted to classify the different animals from the coastal regions of eastern Queensland as subspecies rather than full species.

In terms of the southern New Guinea population, it is clearly reproductively isolated from Australian specimens and so there are good grounds to classify it as a full species.

However I defer from this on several grounds, including the fact that in the recent geological past (well within the last 25,000 years), both Australia and New Guinea were connected by a broad land bridge and there was no known impediment to the lizards having contact. Further noted is that the species has a habitat preference for lowland savannahs and the like, which was presumably the habitat in the now inundated region of water. It should also be realized that these lizards are mobile and do invade habitats as they become available. A good example is seen when numerous lizards recolonize areas recently burnt.

On the basis of all the preceding, the New Guinea form and the coastal Queensland form are described herein as new subspecies according to the Zoological Code (Ride et. al. 1999).

#### **CHLAMYDOSAURUS KINGII KINGII**

**Diagnosis:** The nominate form is separated from the other two on the basis of coloration of the open, extended frill.

In this taxon it has large areas of red and orange, whereas this is not the case in the other two subspecies, which in general have silvery or greyish frills.

When *C. kingii kingii* lightens on the cheeks or inner frill, the colour is a light yellow as opposed to white.

When *Chlamydosaurus kingii pughae* subsp. nov. has white on the inner frill, it does not have white flecks on the outer frill as seen in *C. kingii mickpughi* subsp. nov..

The nominate form is also the largest of the three subspecies, although *C. kingii mickpughi* sp. nov. from coastal Queensland and nearby usually fits within the same average size-class range.

#### **CHLAMYDOSAURUS KINGII PUGHAЕ SUBSP. NOV.**

**Holotype:** A specimen in the Australian Museum, Sydney, NSW, Australia, specimen number R66770 from Boset [=Bosset], Fly River, Western District, Papua New Guinea Lat. 7° 14' S, Long. 141° 05' E. The Australian Museum is a government-owned facility that allows researchers access to its collection.

**Paratypes:** The first paratype is a specimen in the Australian Museum, Sydney, NSW, Australia, specimen number: R40715 from Kuru [Village], Western District, Papua New Guinea, Lat. 8°55' S, Long. 143°03' E. The second paratype is a specimen in the Australian Museum, Sydney, NSW, Australia, specimen number: R40716 from New Guinea, Wim, Western District, Papua New Guinea, Lat. 8°46' S, Long. 142°47' E. The Australian Museum is a government-owned facility that allows researchers access to its collection.

**Diagnosis:** This is the New Guinea form of *C. kingii*.

*Chlamydosaurus kingii pughae* subsp. nov. is most easily separated from the nominate Australian form on the basis of colour. *C. kingii kingii* has red and orange on its open frill, whereas *Chlamydosaurus kingii pughae* subsp. nov. have a marbled grey frill with a hint of brown.

In turn Eastern Queensland (Australian) *C. kingii mickpughi* subsp. nov. are separated from both other taxa by the white flecks in the open frill and large white patches on the cheeks and inner frill.

*C. kingii mickpughi* sp. nov. and *C. kingii kingii* both from Australia grow larger than the New Guinea form (*Chlamydosaurus kingii pughae* subsp. nov.) and also have a relatively larger frill than the New Guinea form.

When *Chlamydosaurus kingii pughae* subsp. nov. has white on the inner frill, it does not have white flecks on the outer frill as seen in *C. kingii mickpughi* subsp. nov..

When *C. kingii kingii* lightens on the cheeks or inner frill, the colour is a light yellow as opposed to white.

*Chlamydosaurus kingii pughae* subsp. nov. is only known from southern New Guinea in the region from about Merauke in Irian Jaya, eastward to the Fly River basin and then patchily distributed in suitable savannah habitat east from there.

In Europe and the USA, the most commonly kept form by hobbyists is the subspecies *Chlamydosaurus kingii pughae* subsp. nov..

**Etymology:** Named in honour of Mip Pugh of Geelong, Victoria, Australia, known to many as the dragon lady, in recognition of her work spanning decades breeding reptiles, most notably dragons such as Bearded Dragons, Frill-necked and others.

#### **CHLAMYDOSAURUS KINGII MICKPUGHI SUBSP. NOV.**

**Holotype:** A specimen in the Australian Museum, Sydney, NSW, Australia, specimen number: R10249 from Yeppon Crossing, Queensland, Australia, Lat. 23°08' S, Long. 150°44' E.

The Australian Museum is a government-owned facility that allows researchers access to its collection.

**Paratypes:** The first paratype is a specimen in the Australian Museum, Sydney, NSW, Australia, specimen number: R20762 from Bundaberg, Queensland, Lat. 24°52' S, Long. 152°21' E.

The Australian Museum is a government-owned facility that allows researchers access to its collection.

The second paratype is a specimen in the Natural History Museum of Los Angeles, USA, specimen number: R74375 from 6 miles south-west of Bundaberg, Queensland, Lat. 24°92' S, Long. 152°28' E.

The Natural History Museum of Los Angeles is a government-owned facility that allows researchers access to its collection.

The third paratype is a specimen in the California Academy of Sciences, USA, specimen number: 77531, from 15 miles South of Duaringa, Queensland, Australia, Lat. 23°86' S, Long. 149°57' E.

The fourth paratype is a specimen in the California Academy of Sciences, USA, specimen number: 77532, from 15 miles South of Duaringa, Queensland, Australia, Lat. 23°86' S, Long. 149°57' E.

The California Academy of Sciences is a government-owned facility that allows researchers access to its collection.

**Diagnosis:** *C. kingii mickpughi* sp. nov. is the form of *C. kingii* from the coast of north Queensland and adjacent areas. It is most easily separated from the other two subspecies by the following suite of characters: The color of the frill when extended is silverish, as opposed to containing large areas of red, brown or orange. The cheeks and inner frill have white patches (unlike the other two subspecies) and there are white flecks on the frill.

When *C. kingii kingii* lightens on the cheeks or inner frill, the colour is a light yellow as opposed to white.

When *Chlamydosaurus kingii pughae* subsp. nov. has white on the inner frill, it does not have white flecks on the outer frill as seen in *C. kingii mickpughi* subsp. nov..

In terms of size, adults are in the same size range as specimens from elsewhere in Australia, but on average larger and more robust than New Guinea specimens, now attributable to the subspecies *Chlamydosaurus kingii pughae* subsp. nov..

**Etymology:** Named in honor of Mick Pugh of Geelong, Victoria, Australia.

He has been a valued member of the Australian herpetological community for decades and was a foundation member of the Victorian Association of Amateur Herpetologists, taking over the role of President sometime later in the 1990's a position he has held for more than a decade.

He poured a huge amount of time and money into promotion of the society and its virtues and never sought any benefits in return.

#### REFERENCES CITED

- Badger, D. and Netherton, J. 2002. *Lizards: A natural History of some uncommon creatures, extraordinary Chameleons, Iguanas, Geckos and more*. Voyageur Press, Stillwater, Minnesota, USA:160 pp.
- Beddard, F. E. 1905. A contribution to the anatomy of the frilled lizard (*Chlamydosaurus kingi*) and some other Agamidae. *Proc. Zool. Soc. London* 1905:9-22.
- Bonetti, M. 2002. 100 *Sauri*. Mondadori (Milano):192 pp.
- Boulenger, G. A. 1885. Catalogue of the Lizards in the British Museum (Nat. Hist.) I. Geckonidae, Eublepharidae, Uroplatidae, Pygopodidae, Agamidae. London:450 pp.
- Boulenger, G. A. 1895. Remarks on the failure of certain cranial characters employed by Prof. Cope for distinguishing lizards from snakes. *Ann. Mag. nat. Hist.* (6)16:366-367.
- Broom, R. 1898. On the lizards of the Chillagoe District, North Queensland. *Proc. Linn. Soc. NSW.* 22:639-645.
- Cogger, H. G. 2000. *Reptiles and Amphibians of Australia* (Sixth edition). Ralph Curtis Publishing, Sanibel Island:808 pp.
- de Rooij, N. D. 1915. *The Reptiles of the Indo-Australian Archipelago. I. Lacertilia, Chelonia, Emydosauria*. Leiden (E. J. Brill):xiv+384 pp.
- Duméril, A. M. C. and Bibron, G. 1837. *Erpétologie Générale ou Histoire Naturelle Complete des Reptiles*. Vol. 4. Libr. Encyclopédique Roret, Paris:570 pp.
- Escoriza Boj, D. 2005. Australia. Reptiles and Amphibians, Part 2: Desert and tropical savanna. *Reptilia* (GB) (41):52-57.
- Garman, S. 1901. Some reptiles and batrachians from Australasia. *Bull. Mus. Comp. Zool. Harvard* 39:1-14.
- Gray, J. E. 1825. A synopsis of the genera of reptiles and Amphibia, with a description of some new species. *Annals of Philosophy* 10:193-217.
- Gray, J. E. 1826. Reptilia. Appendix in: King, P. P. *Narrative of a survey of the Intertropical and Western Coasts of Australia performed between the years 1818 and 1822*. London: John Murray 2:424-434
- Günther, R. and Kapisa, M. 2003. Allochtone Populationen der Kragenechse, *Chlamydosaurus kingii* Gray, 1825, und des Papua-Wasserdrachens, *Lophognathus temporalis* (Günther, 1867), auf der Insel Biak. *Sauria* 25(2):31-35.
- Hauschild, A. and Bosch, H. 1997. *Bartagamen und Kragenechsen*. Natur und Tier Verlag (Münster):95 pp.
- Hörsberg, T. 2004. Ein echter Saurier im Terrarium: Die australische Kragenechse (*Chlamydosaurus kingii*). *Reptilia* (Münster) 9(50):68-73.
- Hörsberg, T. 2008. *Die Kragenechse Chlamydosaurus kingii*. Natur und Tier Verlag, Münster:64 pp.
- Hoser, R. T. 1989. *Australian Reptiles and Frogs*. Pierson Publishing, Sydney:238 pp.
- Kent, W. S. 1895. Observations on the Frilled Lizard, *Chlamydosaurus kingii*. *Proc. Zool. Soc. London* 1895:712-719.
- Macey, J. R., Schulte, J. A., Larson, A., Ananjeva, N. B., Wang, Y., Pethiyagoda, R. and Rastegar-Pouy, N. 2000. Evaluating trans-Tethys migration: an example using acrodont lizard phylogenetics. *Syst. Biol.* 49(2):233-256.
- Manthey, U. and Schuster, N. 1999. *Agamen, 2. Aufl.* Natur und Tier Verlag (Münster):120 pp.
- Middleton, S., Fitzgerald, A. and Pye, G. 1997. Captive breeding of the Frilled Lizard, *Chlamydosaurus kingii*. *Monitor: Journal of the Victorian Herpetological Society* 9(1):6-7.
- Reisinger, M. 1995. Erfahrungen bei der Haltung und Vermehrung der Kragenechse *Chlamydosaurus kingi*. *Elaphe* 3(3):16-20.
- Ride, W. D. L. (ed.) et. al. (on behalf of the International Commission on Zoological Nomenclature) 1999. *International code of Zoological Nomenclature*. The Natural History Museum, Cromwell Road, London SW7 5BD, UK (also commonly cited as "ICZN 1999").
- Ujvari, B. and Madsen, T. 2008. Complete mitochondrial genome of the frillneck lizard (*Chlamydosaurus kingii*, Reptilia; Agamidae), another squamate with two control regions. *Mitochondrial DNA* 19(5):465-470.
- Ujvari, B., Dowton, M. and Madsen, T. 2007. Mitochondrial DNA recombination in a free-ranging Australian lizard. *Biol. Lett.* 3:189-192.
- Ujvari, B., Dowton, M. and Madsen, T. 2008. Population genetic structure, gene flow and sex-biased dispersal in frillneck lizards (*Chlamydosaurus kingii*). *Molecular Ecology* 17:3557-3564.
- 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.

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