

New species of freshwater Crocodile from Northern Australia.

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RAYMOND T. HOSER

LSIDurn:lsid:zoobank.org:author:F9D74EB5-CFB5-49A0-8C7C-9F993B8504AE

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

Phone: +61 3 9812 3322 Fax: 9812 3355 E-mail: snakeman (at) snakeman.com.au

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ABSTRACT

An ongoing audit into the taxonomy and nomenclature of Australasian herpetofauna revealed unnamed species of Crocodile from Northern Australia.

These are formally identified and named for the first time in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999 as amended online since).

All are morphologically divergent from their nearest relatives and based on known geological prehistory, have been divergent for an extended period of time, warranting full species-level recognition.

Two distinctive freshwater crocodiles from the Kimberley district of Western Australia, previously confused with *Crocodylus (Oopholis) johnstoni* Krefft, 1873 or *Crocodylus (Oopholis) webbi* Wells and Wellington, 1985 are also formally named for the first time.

Keywords: taxonomy; nomenclature; Australia; Crocodile; *Crocodylus*; *Oopholis*; *johnstoni*; *webbi*; *oxyi*; *jackyhoserae*; *adelynhoserae*; new species; *shireenae*; *lowingae*.

INTRODUCTION

A study by this author of Freshwater Crocodiles spanning more than 40 years, including travels across all mainland Australian states, inspection of thousands of living and dead specimens, photos of specimens from most major river systems and an audit of available literature and photos has shown there to be an underestimated diversity of species in northern Australia.

With these self-evident facts, the present assignment sought to identify divergent forms based on morphology and distribution and to establish their species boundaries with respect to other similar species.

MATERIALS AND METHODS

An assessment was done of Freshwater Crocodiles across Northern Australia at the same time one was done on northern Australian Freshwater Turtles (or Terrapins), the results of which were eventually incorporated into Hoser (2021).

As far back as 1983, I had noted the different morphology of Freshwater Crocodiles in Geikie Gorge (now Danggu Gorge), in the Kimberley district of north-west Western Australia, as compared to those from the Northern Territory and North-east Queensland, noting that those two forms are also very different and now recognized as separate species.

Other than the papers of Wells and Wellington (1985) and Hoser (2012 and 2018), very little has been published with respect of the taxonomy of freshwater crocodiles in Australia in the last 50 years.

A Synonyms list for Australian Crocodiles to 1983 was published by Cogger *et al.* (1983).

Newly named taxa from the Australian region have been identified by Wells and Wellington (1985), *Crocodylus (Oopholis) webbi*, Hoser (2012), *C. jackyhoserae* and *C. adelynhoserae* and Hoser (2018), *C. oxyi*. I note that the genus name *Oopholis* was first proposed by Gray in 1862.

It was not proposed by myself as alleged by Wolfgang Wuster, Mark O'Shea, Wulf Schleip and Hinrich Kaiser on their "peer reviewed" forum known as "Facebook".

Literature relevant to the taxonomy and nomenclature of Australian crocodiles and the taxonomic decisions herein with respect of Crocodiles in Australia is cited within Cogger *et al.* (1983), Wells and Wellington (1985) and Hoser (2007, 2012 and 2018).

Those preceding named crocodile taxa and the scientific findings of the papers of Wells, Wellington and Hoser were formally validated by Hawkeswood (2021).

The availability of the scientific names proposed by Hoser in 2012 and 2018 was confirmed by the International Commission on Zoological Nomenclature in 2021 in their formal "Opinion 2468" (International Commission on Zoological Nomenclature 2021. Opinion 2468).

The inspection of Australian crocodiles included viewing of live and dead specimens from all parts of the known range within Australia, in the wild, in captivity, in museums and by way of viewing photos of specimens of various size and age with good locality data.

Comparative specimens of freshwater crocodile from most parts of New Guinea, including on the Indonesian side were also

inspected and I should mention here that they were deemed not to be conspecific with any Australian forms on the basis of morphological divergence and significant differences in breeding biology.

RESULTS

In summary, the Australian Freshwater Crocodile, herein placed in *Oopholis* Gray, 1844, treated herein as a subgenus of *Crocodylus*, from the Kimberley district of Western Australia were found to be divergent morphologically from congeners in the Victoria River system in the Northern Territory and east of there.

The two forms formally named below also broadly matched the drainage systems as they were at the ice-age maxima as outlined by Shelley *et al.* (2020).

The Freshwater Crocodiles from the extensive Fitzroy River System were also very divergent from those of the Northern Territory and Queensland and also appear to have been divergent for a time sufficient to have become specifically distinct.

Those from the Prince Regent River and Mitchell River systems of the north-west Kimberley are also divergent and have therefore also been named as a separate taxon, which more-or-less reflects recently identified and divergent taxa of turtles as per Hoser (2021).

Prince Regent River and Mitchell River system freshwater crocodiles also differ slightly from one another, but are herein treated as two forms of the same species.

Because of ongoing environmental pressures in the relevant region, including introduced pests and a push for increased agriculture and irrigation affecting the relevant drainage systems, the relevant species may come under existential threat in the coming century. Therefore I have no hesitation in formally naming the relevant taxa for the first time.

INFORMATION RELEVANT TO THE FORMAL DESCRIPTIONS THAT FOLLOW

There is no conflict of interest in terms of this paper or the conclusions arrived at herein.

Several people including anonymous peer reviewers who revised the manuscript prior to publication are also thanked as are relevant staff at museums who made specimens and records available in line with international obligations.

In terms of the following formal descriptions, spellings should not be altered in any way for any purpose unless expressly and exclusively called for by the rules governing Zoological Nomenclature as administered by the International Commission of Zoological Nomenclature (ICZN).

In the unlikely event two or more newly named taxa are deemed to be the same by a first reviser, then the name to be used and retained is that which first appears in this paper by way of page priority and as listed in the abstract keywords.

Some material in descriptions for taxa may be repeated for other taxa in this paper and this is necessary to ensure each fully complies with the provisions of the *International Code of Zoological Nomenclature* (Fourth edition) (Ride *et al.* 1999) as amended online since.

Material downloaded from the internet and cited anywhere in this paper was downloaded and checked most recently as of 4 June 2021 (including if also viewed prior), unless otherwise stated and was accurate in terms of the content cited herein as of that date.

Unless otherwise stated explicitly, colour and other descriptions apply to living adult specimens of generally good health and not under any form of stress by means such as excessive cool, heat, dehydration, excessive ageing, abnormal skin or reaction to chemical or other input.

While numerous texts and references were consulted prior to publication of this paper, the criteria used to separate the relevant species or subspecies has already been spelt out and/or is done so within each formal description and does not rely on material within publications not explicitly cited herein.

CROCODYLUS (OOPHOLIS) SHIREENAE SP. NOV.

LSIDurn:lsid:zoobank.org:act:6625F2B0-61A6-438B-8051-DF0F3A939100

Holotype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R14919, collected from the Fitzroy River, Western Australia, Australia, Latitude -18.2 S., Longitude 125.6 E. This government-owned facility allows access to its holdings.

Paratype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R91039, collected from the Isdell River, Western Australia, Australia, Latitude -17.1 S., Longitude 125.7 E.

Diagnosis: Adult *Crocodylus shireenae sp. nov.* from the Fitzroy River and adjacent river systems in the southern and south-west Kimberley district of Western Australia and adult *C. lowingae sp. nov.* from the Prince Regent and Mitchell River systems in the west Kimberley are separated from other Australian Freshwater Crocodiles by having a dorsum characterised by three (rarely four) broad and well defined blackish cross-bands, being thick on the midline of the dorsum and getting thinner on the flanks, ending on the mid to lower flanks.

The snout is elongate like in the Northern Territory species, but unlike those species, both *C. shireenae sp. nov.* and *C. lowingae sp. nov.* have a snout that is noticeably concave inwards at the posterior end before the nasal bulge.

Northern Territory and East Kimberley species of Freshwater Crocodile have thin dark bands across the mid dorsum, as opposed to the broad dark areas seen in both *C. shireenae sp. nov.* and *C. lowingae sp. nov.*

C. johnstoni from the east coast drainages of north Queensland are characterised by a relatively short and wide snout and a roof of the mouth that is flattish rather than slightly concave as seen in the species found west of Cape York in northern Australia. Darker markings on the dorsum of *C. johnstoni* are relatively indistinct and banding is not obvious as usually seen in the other species.

C. lowingae sp. nov. is separated from *C. shireenae sp. nov.* by an increased amount of black speckling or pigment on the snout and on the upper surfaces of the limbs.

Saltwater Crocodiles, *C. porosus* Schneider, 1801 are readily separated from the Freshwater species by a short blunt snout; in adults the distance from the snout to a point midway between the eyes is less than twice the width of the head at the level of the eyes; enlarged nuchal shields in two rows (versus one in the Freshwater species), separated from the smooth-skinned parietal region by more than eight granular scales.

Adult specimens of *C. shireenae sp. nov.* from near Derby in Western Australia are depicted in colour images online at:

<https://www.inaturalist.org/observations/110549966>

and

<https://www.inaturalist.org/observations/51201164>

and

<https://www.inaturalist.org/observations/92732779>

Distribution: *C. shireenae sp. nov.* occurs in the Fitzroy River and adjacent river systems in the southern and south-west Kimberley district of Western Australia.

Etymology: Named in honour of my wife, Shireen Hoser, of Park Orchards, Melbourne, Victoria, Australia, in recognition of her many contributions to wildlife conservation over some decades.

CROCODYLUS (OOPHOLIS) LOWINGAE SP. NOV.

LSIDurn:lsid:zoobank.org:act:D7472FCD-8FA0-47DB-B90F-5611C8AD3476

Holotype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R47047 collected from the Prince Regent National Park, Latitude -15.6 S., Longitude 125.3 E. This government-owned facility allows access to its holdings.

Paratype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R47040 collected from the Prince Regent National Park, Latitude -15.4 S., Longitude 125.6 E.

Diagnosis: Adult *Crocodylus shireenae* sp. nov. from the Fitzroy River and adjacent river systems in the southern and south-west Kimberley district of Western Australia and adult *C. lowingae* sp. nov. from the Prince Regent and Mitchell River systems in the west and north-west Kimberley are separated from other Australian Freshwater Crocodiles by having a dorsum characterised by three broad and well defined blackish cross-bands, being thick on the midline of the dorsum and getting thinner on the flanks, ending on the mid to lower flanks.

The snout is elongate like in the Northern Territory species, but unlike those species, both *C. shireenae* sp. nov. and *C. lowingae* sp. nov. have a snout that is noticeably concave inwards at the posterior end before the nasal bulge.

Northern Territory and East Kimberley species of Freshwater Crocodile have thin dark bands across the mid dorsum, as opposed to the broad dark areas seen in both *C. shireenae* sp. nov. and *C. lowingae* sp. nov.

C. johnstoni from the east coast drainages of north Queensland are characterised by a relatively short snout and a roof of the mouth that is flattish rather than slightly concave as seen in the species found west of Cape York in northern Australia. Darker markings on the dorsum of *C. johnstoni* are relatively indistinct and banding is not obvious as usually seen in the other species.

C. lowingae sp. nov. is separated from *C. shireenae* sp. nov. by an increased amount of black speckling or pigment on the snout and upper surfaces of the limbs, and typically (but not always) with less distinct dorsal cross-bands in adults.

Saltwater Crocodiles, *C. porosus* Schneider, 1801 are readily separated from the Freshwater species by a short blunt snout; in adults the distance from the snout to a point midway between the eyes is less than twice the width of the head at the level of the eyes; enlarged nuchal shields in two rows (versus one in the Freshwater species), separated from the smooth-skinned parietal region by more than eight granular scales.

Distribution: *C. lowingae* sp. nov. occurs in the Prince Regent and Mitchell River systems in the north west Kimberley district of Western Australia.

Etymology: Named in honour of Vicki Lowing, also known as the Crocodile Lady, of Rockbank, Victoria in recognition of her services to crocodile conservation in Australia.

For more details about Vicki Lowing, see the etymology for *Lowingdella* Hoser, 2020 at page 73 of Hoser (2020).

REFERENCES CITED

Cogger, H. G., Cameron, E. E. and Cogger, H. M. 1983. *Zoological Catalogue of Australia, Volume 1: Amphibia and Reptilia*. Australian Government Publishing Service, Canberra, Australia:313 pp.

Gray, J. E. 1862. A synopsis of the species of crocodiles. *Ann. Mag. Nat. Hist.* (3)10:265-274.

Hawkeswood, T. J. 2021. Time to end taxonomic vandalism by Wolfgang Wuster *et al.*: The Snakeman, Raymond Hoser's publications are validly published and his names available according to the ICZN: Objective investigation finds Hoser's taxonomic works as scientific best practice and in every relevant case identifies valid entities. *Calodema*, 860:1-59.

Hoser, R. T. 2007. Wells and Wellington - It's time to bury the hatchet. *Calodema* Supplementary Paper 1:1-9.

Hoser, R. T. 2012. A review of the taxonomy of the living Crocodiles including the description of three new tribes, a new genus, and two new species. *Australasian Journal of Herpetology* 14:9-16.

Hoser, R. T. 2018. A new species of Freshwater Crocodile from the Bird's head region of New Guinea. *Australasian Journal of Herpetology* 37:11-13.

Hoser, R. T. 2020. 3 new tribes, 3 new subtribes, 5 new genera, 3 new subgenera, 39 new species and 11 new subspecies of mainly small ground-dwelling frogs from Australia. *Australasian Journal of Herpetology*, 50-51:1-128.

Hoser, R. T. 2021. Audit finds dozens of unnamed turtle taxa. A body of evidence results in newly named genera, subgenera, species and subspecies based on historical and morphological divergence. *Australasian Journal of Herpetology* 52-53:1-128.

International Commission on Zoological Nomenclature 2021. Opinion 2468 (Case 3601) - *Spracklandus* Hoser, 2009 (Reptilia, Serpentes, Elapidae) and *Australasian Journal of Herpetology* issues 1-24: confirmation of availability declined; Appendix A (Code of Ethics): not adopted as a formal criterion for ruling on Cases. *Bulletin of Zoological Nomenclature* 78 (30 April 2021):42-45.

Krefft, G. 1873. Remarks on Australian crocodiles, and description of a new species. *Proc. Zool. Soc. London* 1873:334-335.

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").

Shelley, J.J., Swearer, S. E., Dempster, T., Adams, M., Le Feuvre, M. C., Hammer, M. P. and Unmack, P. 2020. Plio-Pleistocene sea-level changes drive speciation of freshwater fishes in north-western Australia. *Journal of Biogeography* 2020;00:1-12.

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.

CONFLICT OF INTEREST

None.

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