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An overdue refinement of the taxonomy of the Australian Ring Tailed Dragons, Genus *Ctenophorus* Fitzinger, 1843, Subgenus *Tachyon* Wells and Wellington, 1985, including the formal descriptions of eight new species.

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ABSTRACT

The Australian Ring-tailed Dragons of the Genus *Ctenophorus* Fitzinger, 1843, Subgenus *Tachyon* Wells and Wellington, 1985 as defined by Hoser in 2015, have been generally neglected in their taxonomy since the publication of Wells and Wellington (1985).

Those authors formally divided the species *Grammatophora caudicincta* Günther, 1875 six ways in line with the earlier subspecies divisions of Storr (1967) and placed all into their newly created genus *Tachyon*.

This arrangement was vehemently opposed by a group of pseudo-scientists known as the Wolfgang Wüster gang for reasons of personal animosity rather than science. Furthermore due to the ruthless and improper methods of the group (as demonstrated in a war-cry document called Kaiser et *al.* 2013), they have effectively forced other publishing herpetologists to refuse to accept the Wells and Wellington taxonomy and nomenclature in the three and half decades since the 1985 paper of Wells and Wellington.

In spite of lies, deception and so-called smoke and mirrors as practiced by the Wolfgang Wüster gang, science progresses and in line with this, Melville *et al.* (2016) not only broadly validated the much lampooned taxonomy and nomenclature of Wells and Wellington (1985), but furthermore wholly validated the taxonomy of Hoser in 2015.

Melville *et al.* (2016) also provided sound evidence of the presence of at least seven more unnamed species in the complex, all diverged from nearest ancestors in the Pliocene Epoch (at least 2.5 MYA) mirroring the morphological evidence of Storr (1967).

This paper in effect combines the results of Storr (1967) with Melville *et al.* (2016) with the added benefit of inspection of live specimens from the seven relevant populations and all previously named forms to formally describe and name eight new species in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

The eighth named species is separated from others by a biogeographical barrier of known antiquity.

Each is estimated to have diverged from their nearest common ancestor at least 2.5 million years prior and as they are ecologically and distributionally separated, are clearly separate species by any currently used definition.

The first ever proper diagnosis of the expanded subgenus *Tachyon* Wells and Wellington, 1985 was published by Hoser in 2015. It has stood the test of time and is repeated in this paper.

Keywords: Taxonomy; nomenclature; lizards; dragons; Agamidae; *Ctenophorus*; *Tachyon*; *Grammatophora*; *Amphibolurus*; Western Australia; Queensland; Northern Territory; Australia; Ring-tailed dragon; *caudicinctus*; *caudicincta*; *yinnietharra*; *graafi*; *imbricatus*; *infans*; *macropus*; *mensarum*; *slateri*; new species; *adelynhoserae*; *jackyhoserae*; *katrinahoserae*; *lenhoseri*; *maxinehoserae*; *ronhoseri*; *sharonhoserae*; *shireenhoserae*.

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INTRODUCTION

As part of an ongoing audit of Australia's reptiles and frogs, the lizards within the putative genus *Tachyon* Wells and Wellington, 1985, (herein treated as a subgenus), better known as the Australian Ring Tailed Dragons were examined with a view to confirming the taxonomy and nomenclature of relevant species or subspecies as being correct, or in the alternative being altered to reflect the biological reality.

Tachyon was originally erected as a genus by Wells and Wellington (1985), but the molecular evidence of Pyron *et al.* (2013) suggested that a more accurate placement of the relevant species was as a subgenus within the better-known *Ctenophorus* Fitzinger, 1843.

Hoser (2015g) was the first publishing herpetologist since Wells and Wellington (1985) to utilize the genus name *Tachyon*, but in line with the results of Pyron *et al.* (2013) relegated the genus to a subgenus, within the genus *Ctenophorus.* The genus was also expanded to include two closely related species, namely *C. yinnietharra* (Storr, 1981) and *C. ornatus* (Gray, 1845).

Hoser (2015g) treated all other previously named forms of the three putative species as subspecies, all within *C. caudicincta* (Günther, 1875) pending the publication of this paper.

Specimens of all relevant species or subspecies (named and until now unnamed) were examined both live in the wild and via museum collections and their records, including all State and Territory Museums on mainland Australia. Furthermore photos and data with accurate locality data was also assessed, as was all relevant previously published scientific literature and the so-called grey literature in the form of popular mass-market books, internet sites, blogs, photo-sharing sites and the like.

Two papers of key relevance to the relevant taxa were those of Storr (1967), which had a detailed morphological analysis of most relevant species and/or subspecies, as well as a more recent paper of Melville *et al.* (2016), which inspected the same putative taxa at the molecular level, including the species originally described as *Grammatophora ornata* Gray, 1854, which clearly fell within the broader species grouping and the putative genus *Tachyon* Wells and Wellington, 1985 as defined by Hoser (2015g).

I note that Melville *et al.* (2016) failed to inspect the relevant species *C. yinneatharra* Storr, 1981, although it's position in their published phylogeny could be easily inferred as being closest to their clade labelled as "*C. ornatus".* They also failed to inspect specimens from the Mount Isa area or south of there, even though they form a separate biogeographically isolated population, apart from those they inspected.

The combined evidence of these papers alone gave rise to a well-founded belief that there were at least seven unnamed forms at the species level.

Relevant specimens were examined and confirmed that each of these forms warranted recognition at the species level, which is the main basis for publishing this paper. That is to formally name and make available names for the seven species-level taxa, and the other eighth species-level taxon not inspected by either Melville *et al.* (2016) or Storr (1967), all being named in accordance with the rules of the *International Code of Zoological Nomenclature* (Ride *et al.* 1999).

MATERIALS, METHODS AND RESULTS

These are inferred in both the abstract and introduction and self evident in the descriptions that follow.

An audit of relevant species of Australian Ring-tailed Dragons of the subgenus *Tachyon* Wells and Wellington, 1985 *sensu lato* as defined by Hoser (2015g) confirmed the generic level assignment of species and validity of the relevant named forms as identified by Wells and Wellington (1985) as placed by Hoser (2015g) and/or in line with it, as well as the species originally described as *Grammatophora ornata* Gray, 1854, which is clearly a part of the species complex (= same subgenus) and *C. yinneatharra* (Storr, 1981), as previously allocated by Hoser (2015g).

Specimens of all relevant species (named and until now unnamed) were examined both live in the wild and via museum collections and/or their records, including all State and Territory Museums on mainland Australia. Furthermore photos and data with accurate locality data was also assessed, as was all relevant previously published scientific literature and the so-called grey literature in the form of popular mass-market books, internet sites, blogs, photo-sharing sites and the like.

The final results of this audit found that within the so-called *Grammatophora caudicincta* Günther, 1875 complex, there were eight recognized species, these being those six cited by Wells and Wellington (1985) on page 20 at top, as well as the species originally described as *Grammatophora ornata* Gray, 1854, and also the species originally described as *Amphibolurus yinneatharra* Storr, 1981, both of which Wells and Wellington (1985) placed in the genus *Ctenophorus* Fitzinger, 1843 (type species *Grammatophora decresii* Duméril and Bibron, 1837).

There were also eight more forms within the subgenus *Tachyon* worthy of species-level recognition based on molecular divergence, morphological differences and geographical disjunction caused by well-established biogeographical barriers of significant and known antiquity.

In summary the relevant unnamed species are as follows:

1/ The species *Ctenophorus macropus* (Storr, 1967) of northern Australia was found to comprise five geographically separated species. Each was restricted to relevant rock formations (mountain ranges and outliers) and separated from one another by relatively flat intervening areas, which happen to be well-known biogeographical barriers of known antiquity.
Type *C. macropus* is the form from Arnhem Land in the Northern Territory, while two populations in the Kimberley Ranges of Western Australia, one from the Gulf of Carpentaria and one from the Selwyn Ranges, north-west Queensland (around Mount Isa and south of there) were unnamed. These are formally described herein.

2/ The species *C. slateri* (Storr, 1967) is clearly composite, with the nominate form from Central Australia and the northern population is unnamed and so it is formally described herein as a new species.

3/ Nominate *C. caudicincta* (Günther, 1875) including as identified by Melville *et al.* (2016) with a distribution centred on the Pilbara region of Western Australia was shown by them to consist of two allopatric species and the previously unnamed south-east Pilbara form is formally described herein.

4/ The morphologically distinct and genetically divergent population of putative *Grammatophora ornata* Gray, 1854 (herein placed within the subgenus *Tachyon*) from the north-west part of the range of the putative species distribution is herein described as a new species as is another divergent form from the inland parts of the south-east of Western Australia (the Goldfields region).
Gray's holotype specimen, lacks specific locality data.

But based on the original written descriptions of Gray and Boulenger (1885) it is clearly of the form from near Perth, Western Australia and so it is the nominate species *C. ornata.*
In passing I note that the statement by Melville *et al.* (2016), "With our recommendations the *C. caudicinctus* species group, which currently incorporates six subspecies, would become four species: *C. caudicinctus*, *C. infans*, *C. slateri* and *C. graafi*." did not make any sense at all, even when reconciled exclusively with the data the same authors presented in the very same paper and noting that the authors also recklessly overlooked the species *C. yinneatharra* (Storr, 1981), even though a year prior Hoser (2015g) had correctly placed that taxon within the species group. It is self-evident from the morphological evidence of Storr (1967) and molecular evidence of Melville *et al.* (2016) that the case for recognition of *C. mensarum* (Storr, 1967) as a full species is weaker than for all other species (including the five formally named herein).

This includes significantly less molecular divergence from nominate *C. caudicincta* (as shown by Melville *et al.* 2016) than for all other putative species, including the eight formally named

herein.

However that taxon *C. mensarum* (Storr, 1967) is tentatively recognized at the full species level within this paper pending further work on allegedly intermediate specimens between the two putative forms.

The genus-level arrangement of relevant species and other Australian agamids was found to be in accordance with the published results of Hoser (2015g), which was so accurate as to not needing any alteration of diagnoses at this point in time. Newly named species herein simply fit within the same diagnosed genus or subgenus as does their nearest known relative.

The literature relevant to the taxonomy and nomenclature of the subgenus *Tachyon* as first defined by Wells and Wellington (1985) and redefined by Hoser (2015g) and herein, including the taxonomic and nomenclatural decisions herein include the following: Ahl (1926), Baverstock and Bradshaw (1975), Boulenger (1885), Bradshaw (1970, 1971), Bradshaw and Main (1968), Bradshaw and Shoemaker (1967), Cogger (2014), Cogger *et al.* (1983), Denzer *et al.* (1997), Doody and Schembri (2014), Even (2005), Fitzinger (1843), Glauert (1959), Gray (1845), Günther (1875), Hoser (2015g), Kinghorn (1924), Lebas and Spencer (2000), Melville *et al.* (2001, 2016), Peters (1876), Pyron *et al.* (2013), Ride *et al.* (1999), Sternfeld (1925), Storr (1967, 1981), Storr *et al.* (1983), Wells and Wellington (1985) Wilson and Knowles (1988), Wilson and Swan (2017) and sources cited therein.

FURTHER DISCUSSION RELEVANT TO THIS PUBLICATION

An illegal armed raid and theft of materials on 17 Aug 2011 effectively stopped the publication of a variant of this paper being published back then and a significant amount of materials taken in that raid was not returned. This was in spite of court orders telling the relevant State Wildlife officers to do so (Court of Appeal 2014, Victorian Civil and Administrative Tribunal 2015). Rather than run the risk of species becoming threatened or extinct due to non-recognition of them as shown in Hoser (2019a, 2019b), I have instead opted to publish this paper in its current form, even though a significant amount of further data was intended to be published and is not.
Naming of taxa is perhaps the most important step in their ultimate preservation and it is with this motivation in mind (protection of biodiversity) that I have chosen to publish this paper.

Until now, no new (and generally recognized) taxa within the so-called *Grammatophora caudicincta* Günther, 1875 complex of species has been formally identified or named since the paper of Storr (1967).

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.

In the unlikely event two newly named taxa are deemed conspecific 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 1 March 2020, unless otherwise stated and was accurate in terms of the context cited herein as of that date.

Unless otherwise stated explicitly, colour descriptions apply to living adult male specimens of generally good health and not under any form of stress by means such as excessive cool, heat, dehydration or abnormal skin 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 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.
Each newly named species is readily and consistently separable from their nearest congener and that which until now it has been previously treated as.

Delays in recognition of these species could jeopardise the long-term survival of these taxa as outlined by Hoser (2019a, 2019b) and sources cited therein.

Therefore attempts by taxonomic vandals like the Wolfgang Wüster gang via Kaiser (2012a, 2012b, 2013, 2014a, 2014b) and Kaiser *et al.* (2013) (as frequently amended) to unlawfully suppress the recognition of these taxa on the basis they have a personal dislike for the person who formally named it should be resisted (Dubois *et al.* 2019).
Claims by the Wüster gang against this paper and the descriptions herein will no doubt be no different to those the gang have made previously, all of which were discredited long ago as outlined by Dubois *et al.* (2019), Hoser, (2007, 2009, 2012a, 2012b, 2013a, 2015a-f, 2019a, 2019b) and sources cited therein.

The following genus and subgenus-level diagnosis of the relevant lizard species is taken in an abridged form from Hoser (2015g) and excluding formal diagnoses of the subgenera not subject of this paper.
Formal descriptions of the eight relevant species follow.
Information relevant to conservation of Australian reptiles in Hoser (1989, 1991, 1993 and 1996) and relevant comments in Hoser (2019a, 2019b) applies to the newly named taxa herein.

GENUS *CTENOPHORUS* FITZINGER, 1843.

Type species: *Grammatophora decresii* Dumeìril and Bibron 1837.

Diagnosis: *Ctenophorus* as defined until now (see also Cogger 2014) is defined by the following definition, modified to take into account the genera defined by Hoser (2015g) being the most recent full and proper treatment of the genus. *Ctenophorus* is defined as an Australian agamid genus characterised by small dorsal scales, homogenous or with at most slightly enlarged tubercles; a few species with distinct rows of paravertebral or dorsolateral spinose scales; a row of enlarged scales from below the eye to above the ear; tympanum exposed (not exposed in *Notactenophorus* Hoser 2015) and most *Pseudoctenophorus* Hoser, 2015; tail long, ranging from slightly to much longer than the head and body; femoral and preanal pores present in males; adult males usually with distinctive black or dark grey markings on the throat and/or chest.

The genus *Paractenophorus* Hoser, 2015 is separated from *Ctenophorus*, *Notactenophorus* Hoser 2015 and *Pseudoctenophorus* Hoser, 2015 by the following suite of characters: tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb reaching no further than the tympanum when adpressed; tail usually less than 1.5 times as long as the head and body; nasal region is not swollen, the nostril lying below an angular canthal ridge; pores fewer than 15; nostril is slit-like or narrowly elliptical.

Specimens within the genus *Pseudoctenophorus* Hoser, 2015 are separated from all other *Ctenophorus* Fitzinger, 1843, the genus they were placed in previously, by the following suite of characters, being one or other of the following three:

1/ Tympanum exposed; a series of enlarged, spinose scales on either side of the base of the tail (subgenus *Pseudoctenophorus* Hoser, 2015), or:

2/ Tympanum hidden; covered by skin; body scales are strongly

heterogeneous, many of the larger scales on the body and head keeled or moderately spinose; a series of enlarged, spinose scales on either side of the base of the tail (subgenus *Chapmanagama* Hoser, 2015), or:

3/ Tympanum hidden; covered by skin; body scales are strongly heterogeneous, many of the larger scales on the body and head keeled or moderately spinose; no series of enlarged, spinose scales on either side of the base of the tail (subgenus *Turnbullagama* Hoser, 2015).

Notactenophorus Hoser, 2015 is readily separated from all other members of the genus *Ctenophorus* (where it has been placed until now, as defined in Cogger 2014) and *Pseudoctenophorus* Hoser, 2015, by the following unique suite of characters: Tympanum is hidden being covered by skin, the body scales are smooth, mostly small, homogenous, with scattered larger but small, flat scales, not keeled or spinose, with a dorsal pattern of a longitudinal dorso-lateral series of five or six large black spots on either side.

Distribution: Most parts of continental Australia.

Content: *C. decresii* (Duméril and Bibron, 1837) (type species); *C. adelynhoserae sp. nov.*; *C. caudicinctus* (Günther, 1875); *C. cristatus* (Gray, 1841); *C. dudleyi* Wells and Wellington 1985; *C. femoralis* (Storr, 1965); *C. fionni* (Procter, 1923); *C. fordi* (Storr, 1965); *C. gibba* (Houston, 1974); *C. graafi* (Storr, 1967); *C. hawkeswoodi* (Wells and Wellington, 1985); *C. imbricatus* (Peters, 1876); *C. infans* (Storr, 1967); *C. isolepis* (Fischer, 1881); *C. jackyhoserae sp. nov.*; *C. katrinahoserae sp. nov.*; *C. lenhoseri sp. nov.*; *C. macropus* (Storr, 1967); *C. maculatus* (Gray, 1831); *C. maxinehoserae sp. nov.*; *C. mckenziei* (Storr, 1981); *C. mirrityana* McLean, Moussalli, Sass and Stuart-Fox, 2013; *C. nguyarna* Doughty, Maryan, Melville and Austin, 2007; *C. mensarum* (Storr, 1967); *C. nuchalis* (De Vis, 1884); *C. ornatus* (Gray, 1845); *C. pictus* (Peters, 1866); *C. raffertyi* Wells and Wellington, 1985; *C. reticulatus* (Gray, 1845); *C. ronhoseri sp. nov.*; *C. rubens* (Storr, 1965); *C. rufescens* (Stirling and Zietz, 1893); *C. salinarum* Storr, 1966; *C. scutulatus* (Stirling and Zietz, 1893); *C. sharonhoserae sp. nov.*; *C. shireenhoserae sp. nov.*; *C. slateri* (Storr, 1967); *C. tjantjalka* Johnston, 1992; *C. vadnappa* Houston, 1974; *C. yinnietharra* (Storr, 1981).

Comments: All of *C. graafi* (Storr, 1967); *C. imbricatus* (Peters, 1876); *C. infans* (Storr, 1967); *C. macropus* (Storr, 1967); *C. mensarum* (Storr, 1967); *C. slateri* (Storr, 1967) were treated by Hoser (2015g) as synonyms of *C. caudicinctus* (Günther, 1875) pending publication of this paper.

Hoser (2015g) erroneously treated *C. raffertyi* Wells and Wellington, 1985 as a synonym of *C. clayi* (Storr, 1967) by overlooking it in an error also not picked up in peer review. However the taxon *C. raffertyi* is herein regarded as valid on the basis of morphological and distributional divergence across a biogeographical barrier of known antiquity.

In an act of taxonomic vandalism, Sadlier *et al.* (2019) deliberately illegally renamed the taxon *C. hawkeswoodi* (Wells and Wellington, 1985) as recognized as valid by Hoser (2015g) as *Ctenophorus spinodomus* Sadlier *et al.* (2019).

The *International Code of Zoological Nomenclature* (Ride *et al.* 1999) is clear in its directives in terms of the rule of priority and so the correct name for this taxon is *C. hawkeswoodi* (Wells and Wellington, 1985).

That species is part of the *C. fordi* (Storr, 1965) species complex subject of another paper (Hoser 2000).

While it is self-evident that some of the species diagnoses in the paper of Wells and Wellington (1985) are vague and imprecise, the fact remains that the relevant names are available in terms of the rules of the *International Code of Zoological Nomenclature*, meaning that the relevant paper should be consulted if and when herpetologists are doing taxonomic works on Australian reptiles and frogs and there is a likelihood of a priority name being available for a taxon.

Overwriting a Wells and Wellington name may give a later worker a sense of greatness in being able to claim “discovery” of a species, but this “discovery” will evaporate at a future date when a later scientist is forced to waste their time and correct the historical record and re-instate the correct Wells and Wellington nomen.

The time spent doing this would be better diverted towards new science and the wildlife conservation objectives that this serves. This is particularly the case in the context of Australian reptiles, where as of 2020 dozens of species still await formal description.

SUBGENUS *TACHYON* WELLS AND WELLINGTON, 1985.

Type species: *Grammatophora caudicincta* Günther, 1875.

Diagnosis: Species within the subgenus *Tachyon* Wells and Wellington, 1985 are separated from all other *Ctenophorus* Fitzinger, 1843 by the following suite of characters being one or other of:

1/ Tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb usually reaching to eye or beyond when adpressed; tail usually much more than 1.5 times as long as the head and body; canthus rostralis swollen, but nostrils, when viewed from above, face distinctly upwards as opposed to outwards (species *C. adelynhoserae sp. nov.*; *C. caudicinctus* (Günther, 1875); *C. graafi* (Storr, 1967); *C. imbricatus* (Peters, 1876); *C. infans* (Storr, 1967); *C. jackyhoserae sp. nov.*; *C. katrinahoserae sp. nov.*; *C. lenhoseri sp. nov.*; *C. macropus* (Storr, 1967); *C. maxinehoserae sp. nov.*; *C. mensarum* (Storr, 1967); *C. ronhoseri sp. nov.*; C. *slateri* (Storr, 1967)) or:

2/ Tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb usually reaching to eye or beyond when adpressed; tail usually much more than 1.5 times as long as the head and body; canthus rostralis angular or moderately swollen, but nostrils, when viewed from above, face outwards as opposed to distinctly upwards (as seen in the species *C. adelynhoserae sp. nov.*; *C. caudicinctus* (Günther, 1875); *C. graafi* (Storr, 1967); *C. imbricatus* (Peters, 1876); *C. infans* (Storr, 1967); *C. jackyhoserae sp. nov.*; *C. katrinahoserae sp. nov.*; *C. lenhoseri sp. nov.*; *C. macropus* (Storr, 1967); *C. maxinehoserae sp. nov.*; *C. mensarum* (Storr, 1967); *C. ronhoseri sp. nov.*; *C. slateri* (Storr, 1967)); at most a few enlarged keeled scales on the nape; a series of enlarged vertebral scales, if present, forming a distinct linear series only to about the level of the forelimbs; dorsal scales at most with low, irregular keels which do not form distinct continuous ridges; dorsolateral scales and those on the chest smooth, or with low blunt edges; nostril elliptical in a swollen nasal scale lying on a swollen canthal ridge; tibial region with a series of anterior proximal scales which are very much larger than those on the posterior surface (species *C. shireenhoserae sp. nov.*; *C. sharonhoserae sp. nov.*; *C. ornatus* and *C. yinnietharra*).

Ctenophorus as defined until now (Cogger 2014, Hoser 2015g) is defined by the following definition, modified to take into account the new genera as defined herein. *Ctenophorus* is defined as an Australian agamid genus characterised by small dorsal scales, homogenous or with at most slightly enlarged tubercles; a few species with distinct rows of paravertebral or dorsolateral spinose scales; a row of enlarged scales from below the eye to above the ear; tympanum exposed (not exposed in *Notactenophorus* Hoser, 2015 and most *Pseudoctenophorus* Hoser, 2015); tail long, ranging from slightly to much longer than the head and body; femoral and preanal pores present in males; adult males usually with distinctive black or dark grey markings on the throat and/or chest.

The genus *Paractenophorus* Hoser, 2015 is separated from *Ctenophorus*, *Notactenophorus* Hoser, 2015 and *Pseudoctenophorus* Hoser, 2015 by the following suite of characters: tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb reaching no further than the tympanum when adpressed; tail usually less than 1.5 times as long as the head and body; nasal region is not swollen, the nostril lying below an angular canthal ridge; pores fewer than 15; nostril is slit-like or narrowly elliptical.

Specimens within the genus *Pseudoctenophorus* Hoser, 2015 are separated from all other *Ctenophorus* Fitzinger, 1843, the

genus they were placed previously, by the following suite of characters, being one or other of the following three:

1/ Tympanum exposed; a series of enlarged, spinose scales on either side of the base of the tail (subgenus *Pseudoctenophorus* Hoser, 2015), or:

2/ Tympanum hidden; covered by skin; body scales are strongly heterogeneous, many of the larger scales on the body and head keeled or moderately spinose; a series of enlarged, spinose scales on either side of the base of the tail (subgenus *Chapmanagama* Hoser, 2015), or:

3/ Tympanum hidden; covered by skin; body scales are strongly heterogeneous, many of the larger scales on the body and head keeled or moderately spinose; no series of enlarged, spinose scales on either side of the base of the tail (subgenus *Turnbullagama* Hoser, 2015).

Notactenophorus Hoser, 2015 is readily separated from all other members of the genus *Ctenophorus* (where it has been placed until now, as defined in Cogger 2014) and *Pseudoctenophorus* Hoser, 2015 by the following unique suite of characters: Tympanum is hidden being covered by skin, the body scales are smooth, mostly small, homogenous, with scattered larger but small, flat scales, not keeled or spinose, with a dorsal pattern of a longitudinal dorso-lateral series of five or six large black spots on either side.

Distribution: Drier parts of northern, central and Western Australia, including the south-west and invariably associated with rock outcrops.

Content: *Ctenophorus* (*Tachyon*) *caudicinctus* (Günther, 1875) (type species); *C.* (*Tachyon*) *adelynhoserae sp. nov.*; *C.* (*Tachyon*) *graafi* (Storr, 1967); *C.* (*Tachyon*) *imbricatus* (Peters, 1876); *C.* (*Tachyon*) *infans* (Storr, 1967); *C.* (*Tachyon*) *jackyhoserae sp. nov.*; *C.* (*Tachyon*) *katrinahoserae sp. nov.*; *C.* (*Tachyon*) *lenhoseri sp. nov.*; *C.* (*Tachyon*) *macropus* (Storr, 1967); *C.* (*Tachyon*) *maxinehoserae sp. nov.*; *C.* (*Tachyon*) *mensarum* (Storr, 1967); *C.* (*Tachyon*) *ornatus* (Gray, 1845); *C.* (*Tachyon*) *ronhoseri sp. nov.*; *C.* (*Tachyon*) *sharonhoserae sp. nov.*; *C.* (*Tachyon*) *shireenhoserae sp. nov.*; *C.* (*Tachyon*) *slateri* (Storr, 1967); *C.* (*Tachyon*) *yinnietharra* (Storr, 1981).

CTENOPHORUS* (*TACHYON*) *ADELYNHOSERAE SP. NOV.

LSID urn:lsid:zoobank.org:act:4A2B64E0-B3BA-430C-8BD2-DEFBAFFF48D8

Holotype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R125200 collected from the Saint George Range, south-west Kimberley Division of Western Australia, Australia, Latitude -18.75 S., Longitude 125.15 E. This facility allows access to its holdings.

Paratype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R125199 collected from the Saint George Range, south-west Kimberley Division of Western Australia, Australia, Latitude -18.75 S., Longitude 125.15 E.

Diagnosis: The species *Ctenophorus adelynhoserae sp. nov.* from the south-west Kimberley division of Western Australia (being the St. George and Edgar Ranges, north-east of Broome, Western Australia), *C. jackyhoserae sp. nov.* from the northern and eastern Kimberley division of Western Australia and immediately adjacent parts of the Northern Territory, C. *katrinahoserae sp. nov.* from far north-west Queensland and the nearby parts of the Northern Territory, south of the Gulf of Carpentaria and *C. lenhoseri sp. nov.* from the Selwyn Ranges (generally around Mount Isa and south of there), in north-west Queensland, have until now all been treated as populations of *C. macropus* (Storr, 1967) with a distribution centred on Arnhem Land, Northern Territory, with which they are morphologically most similar to.

However all are morphologically distinct, wholly allopatric and sufficiently divergent to be treated as full species as is seen herein, with divergences estimated by Melville *et al.* (2016) to be in excess of 2.5 MYA for all but *C. lenhoseri sp. nov.* which was not inspected by Melville *et al.* (2016).

C. lenhoseri sp. nov. is however separated from the other species by a barrier of known antiquity in far north-west Queensland.

Ctenophorus adelynhoserae sp. nov., *C. jackyhoserae sp. nov.*, *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov.* and *C. macropus* are readily separated by their unique colour patterns.

Adult male *Ctenophorus adelynhoserae sp. nov.* are separated from males of the other species by having a brown dorsum and flanks with either no markings or indistinct ones. Legs are either unmarked or lack obvious markings, which otherwise may include indistinct spots or crossbands. There are scattered dark flecks or peppering along the lower sides and no light blue spots or flecks anywhere on the dorsum. Between the eye and ear is a dark and semi-distinct bar or broken bar. There are 19-21 tail rings, being alternating brown and whitish, the lighter sections being narrower than the darker sections.

Adult females are greyish in colouration and with a greyish head with mottling as opposed to any well-defined markings.

Adult male *C. jackyhoserae sp. nov.* normally have a brownish-red dorsal surface with broken lines or evenly arranged flecks along, but not on the mid-dorsal line. Some specimens alternatively have a whitish-red upper body to deep red, characterised by a dorsal arrangement of about six broken orange-brown-red lines running longitudinally down the body from neck to rump, being broken by intervening areas of creamy-grey white that are wider than the darker markings. The side of the head and labials are whitish or at least with whiter pigment than elsewhere and with indistinct reddish markings near the ear and temples. The top of the head is a dark reddish orange, The lower flanks are characterised by 3-5 dark brown bars across a pale yellowish background, being indistinctly divided from the whitish-grey above, or in some specimens these may reduce to being evenly spaced paired dark spots. There are no light blue spots or flecks anywhere on the dorsum. There is no dark bar between the eye and ear, where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

There are 17-18 tail rings, alternating blackish and whitish, the rings being of even thickness.

Adult female *C. jackyhoserae sp. nov.* are of greyish colouration, featuring brown barring on the lower labial area, no markings, or very indistinct on all limbs and a dorsal surface featuring a mottled appearance of light and dark, but no obvious well defined pattern.

Adult male *C. lenhoseri sp. nov.* have a strongly reddish-brown forebody, becoming greyish towards the rear and tail. On either side of the mid-dorsal line are about 5 pairs of evenly spaced semi-distinct small dark blackish brown spots of semi-rectangular shape, the longer sides being those running towards the flanks. The flanks are more reddish than the mid dorsum, which is slightly greyish and the flanks also have scattered light blue spots or flecks. There are 24-28 tail rings, defined by having very narrow light sections and wide darker sections, being alternating brownish-black and whitish bands. There are no obvious blotches or spots on the lower flanks, or dark bar between the eye and ear, although in some specimens there is dark peppering where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

Adult female *C. lenhoseri sp. nov.* are of similar colour to males, being reddish and without obvious pattern of any sort. The dorsal surface is effectively unicolour, save for a poorly defined zone of darkening along the mid vertebral line and 4-6 well-spaced pairs of small but obvious yellow spots on either side of the mid dorsal line of the body. There are sometimes paired scattered dark spots around the neck, which typically fade in older specimens. There are 18-22 tail rings, with lighter ones being narrow or incomplete and darker ones about 3-4 times wider, the colouration being greyish orange (wider) and yellow (narrower) bands. Fore and hind limbs both have indistinct bands.

Juvenile *C. lenhoseri sp. nov.* of both sexes are characterised by a significant amount of dark brown and black pigment in the form of flecks or mottling on the upper surfaces, which fades with age.

Adult male *C. katrinahoserae sp. nov.* have an orange-grey-brown forebody, with a distinct salmon colouration across whitish parts of the upper forebody and head, becoming dull greyish towards the rear and tail. On either side of the mid-dorsal line are about scattered semi-distinct dark flecks which may also appear on the mid flanks, but the dorsum is otherwise not prominently marked. The flanks are slightly darker than the dorsum at the mid flanks before becoming light again at the belly. There are 20-26 tail rings, defined by having narrow light sections and wide darker sections, being alternating brownish-black and whitish bands. There are no obvious blotches or spots on the lower flanks, or dark bar between the eye and ear, although in some specimens there is dark peppering where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

Adult female *C. katrinahoserae sp. nov.* are of similar colour to males, but generally greyish in colour with lighter yellow-cream interspaces. There is a mottled pattern across the dorsal surface, being most prominent at the anterior end and the sides of the head.

In both sexes, the legs are generally unmarked, but commonly with indistinct blotching, particularly on the lower rear legs upper surface.

Adult male *C. macropus* have a generally light orange dorsal colour, with scattered dark brown flecks on the head and neck, but not on the body or legs. Prominent in this species are numerous bright aqua-blue spots scattered across the dorsal surface and sides of the flanks. There are 19-21 tail rings, with the darker sections being significantly wider than the lighter ones. The anterior tail is generally brownish orange with indistinct bands, while the posterior half of the tail has fairly well defined bands, the colours being brown and yellow-white.

Adult female *C. macropus* are similar in most respects to adult female *C. jackyhoserae sp. nov.* but any yellow spotting on the back near the mid-dorsal line is relatively indistinct and the front legs have well defined bands. Any markings on the rear legs, if present are indistinct.

Ctenophorus adelynhoserae sp. nov. in life is depicted in Storr *et al.* (1983), plate 3, image 4, adult male.

C. jackyhoserae sp. nov. is depicted in life in Wilson and Swan (2017) on page 413 at top left, adult male and Wilson and Knowles (1988), page 207, top left adult male, top right adult female and in Hoser (1989) page 67 top, male.

C. katrinahoserae sp. nov. is depicted in life online at: https://pbase.com/gehyra/image/129646530

(last downloaded on 1 March 2020).

C. lenhoseri sp. nov. is depicted in life in Cogger (2014), bottom left, adult male (aged) and Brown (2014), page 653 (3 images labelled as *Ctenophorus caudicinctus macropus*, Windorah, Queensland, two adult males and an adult female).

All of *Ctenophorus adelynhoserae sp. nov*., *C. jackyhoserae sp. nov*., *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov*. and *C. macropus* can be separated from all congeners in the subgenus *Tachyon* Wells and Wellington, 1985 (as defined elsewhere in this paper), by having over 32 lamellae under the fourth toe versus less than 32 in all other species as well as a tail 2 times the length of snout-vent, versus less than 1.8 times snout-vent in all other species and the adpressed hind-leg extends past the snout (not so in all other species).

All of *Ctenophorus adelynhoserae sp. nov*., *C. jackyhoserae sp. nov*., *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov*. and *C. macropus* are characterised as follows: Distal three-quarters of tail compressed. Nasal small, located on top of obtuse rostral ridge. Keels of dorsal scales moderately strong and sharp, terminating in a blunt end or short spine. Ventrals weakly keeled. Upper labials 15-16. Femoral and preanal pores 26-31.

Distribution: *C. adelynhoserae sp. nov*. is known only from near the type locality of the Saint George Range and nearby ranges, (e.g. Edgar Ranges) south-west Kimberley Division of Western Australia, Australia.

Etymology: *C. adelynhoserae sp. nov*. is named in honour of my eldest daughter, Adelyn Hoser, of Park Orchards, Victoria, Australia in recognition of more than 20 years active work with wildlife conservation, research and education in Australia.

CTENOPHORUS* (*TACHYON*) *JACKYHOSERAE SP. NOV.

LSID urn:lsid:zoobank.org:act:FA6270EE-615D-4F28-9113-B5AB50B622FA

Holotype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R113989 collected from 32 km west of El Questro Station Kimberley Division of Western Australia, Australia, Latitude -16.02 S., Longitude 127.97 E.

This facility allows access to its holdings.

Paratype: A preserved specimen at the Northern Territory Museum, Darwin, Northern Territory, Australia, specimen number R07018 collected from the Pentecost River Crossing on the Gibb River Road, Kimberley Division of Western Australia, Australia, Latitude -16.17 S., Longitude 127.98 E.

Diagnosis: The species *Ctenophorus jackyhoserae sp. nov.* from the northern and eastern Kimberley division of Western Australia and immediately adjacent parts of the Northern Territory, *C. adelynhoserae sp. nov*. from the south-west Kimberley division of Western Australia (being the St. George and Edgar Ranges, north-east of Broome, Western Australia), C. *katrinahoserae sp. nov.* from far north-west Queensland and the nearby parts of the Northern Territory, south of the Gulf of Carpentaria and *C. lenhoseri sp. nov*. from the Selwyn Ranges (generally around Mount Isa and south of there), in north-west Queensland, have until now all been treated as populations of *C. macropus* (Storr, 1967) with a distribution centred on Arnhem Land, Northern Territory, with which they are morphologically most similar to.

However all are morphologically distinct, wholly allopatric and sufficiently divergent to be treated as full species as is seen herein, with divergences estimated by Melville *et al.* (2016) to be in excess of 2.5 MYA for all but *C. lenhoseri sp. nov*. which was not inspected by Melville *et al.* (2016).
C. lenhoseri sp. nov. is however separated from the other species by a barrier of known antiquity in far north-west Queensland.

Ctenophorus adelynhoserae sp. nov., *C. jackyhoserae sp. nov.*, *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov*. and *C. macropus* are readily separated by their unique colour patterns.

Adult male *Ctenophorus adelynhoserae sp. nov*. are separated from males of the other species by having a brown dorsum and flanks with either no markings or indistinct ones. Legs are either unmarked or lack obvious markings, which otherwise may include indistinct spots or crossbands. There are scattered dark flecks or peppering along the lower sides and no light blue spots or flecks anywhere on the dorsum. Between the eye and ear is a dark and semi-distinct bar or broken bar. There are 19-21 tail rings, being alternating brown and whitish, the lighter sections being narrower than the darker sections.
Adult female *C. adelynhoserae sp. nov*. are greyish in colouration and with a greyish head with mottling as opposed to any well-defined markings.

Adult male *C. jackyhoserae sp. nov.* normally have a brownish-red dorsal surface with broken lines or evenly arranged flecks along, but not on the mid-dorsal line. Some specimens alternatively have a whitish-red upper body to deep red, characterised by a dorsal arrangement of about six broken orange-brown-red lines running longitudinally down the body from neck to rump, being broken by intervening areas of creamy-grey white that are wider than the darker markings. The side of the head and labials are whitish or at least with whiter pigment than elsewhere and with indistinct reddish markings near the ear and temples. The top of the head is a dark reddish orange, The lower flanks are characterised by 3-5 dark brown bars across a pale yellowish background, being indistinctly divided from the whitish-grey above, or in some specimens these may reduce to being evenly spaced paired dark spots. There are no light blue spots or flecks anywhere on the dorsum. There is no dark bar between the

eye and ear, where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

There are 17-18 tail rings, alternating blackish and whitish, the rings being of even thickness.

Adult female *C. jackyhoserae sp. nov.* are of greyish colouration, featuring brown barring on the lower labial area, no markings, or very indistinct on all limbs and a dorsal surface featuring a mottled appearance of light and dark, but no obvious well defined pattern.

Adult male *C. lenhoseri sp. nov.* have a strongly reddish-brown forebody, becoming greyish towards the rear and tail. On either side of the mid-dorsal line are about 5 pairs of evenly spaced semi-distinct small dark blackish brown spots of semi-rectangular shape, the longer sides being those running towards the flanks. The flanks are more reddish than the mid dorsum, which is slightly greyish and the flanks also have scattered light blue spots or flecks. There are 24-28 tail rings, defined by having very narrow light sections and wide darker sections, being alternating brownish-black and whitish bands. There are no obvious blotches or spots on the lower flanks, or dark bar between the eye and ear, although in some specimens there is dark peppering where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

Adult female *C. lenhoseri sp. nov.* are of similar colour to males, being reddish and without obvious pattern of any sort. The dorsal surface is effectively unicolour, save for a poorly defined zone of darkening along the mid vertebral line and 4-6 well-spaced pairs of small but obvious yellow spots on either side of the mid dorsal line of the body. There are sometimes paired scattered dark spots around the neck, which typically fade in older specimens. There are 18-22 tail rings, with lighter ones being narrow or incomplete and darker ones about 3-4 times wider, the colouration being greyish orange (wider) and yellow (narrower) bands. Fore and hind limbs both have indistinct bands.

Juvenile *C. lenhoseri sp. nov.* of both sexes are characterised by a significant amount of dark brown and black pigment in the form of flecks or mottling on the upper surfaces, which fades with age.

Adult male *C. katrinahoserae sp. nov.* have an orange-grey-brown forebody, with a distinct salmon colouration across whitish parts of the upper forebody and head, becoming dull greyish towards the rear and tail. On either side of the mid-dorsal line are about scattered semi-distinct dark flecks which may also appear on the mid flanks, but the dorsum is otherwise not prominently marked. The flanks are slightly darker than the dorsum at the mid flanks before becoming light again at the belly. There are 20-26 tail rings, defined by having narrow light sections and wide darker sections, being alternating brownish-black and whitish bands. There are no obvious blotches or spots on the lower flanks, or dark bar between the eye and ear, although in some specimens there is dark peppering where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

Adult female *C. katrinahoserae sp. nov.* are of similar colour to males, but generally greyish in colour with lighter yellow-cream interspaces. There is a mottled pattern across the dorsal surface, being most prominent at the anterior end and the sides of the head.

In both sexes, the legs are generally unmarked, but commonly with indistinct blotching, particularly on the lower rear legs upper surface.

Adult male *C. macropus* have a generally light orange dorsal colour, with scattered dark brown flecks on the head and neck, but not on the body or legs. Prominent in this species are numerous bright aqua-blue spots scattered across the dorsal surface and sides of the flanks. There are 19-21 tail rings, with the darker sections being significantly wider than the lighter ones. The anterior tail is generally brownish orange with indistinct bands, while the posterior half of the tail has fairly well defined bands, the colours being brown and yellow-white.

Adult female *C. macropus* are similar in most respects to adult female *C. jackyhoserae sp. nov.* but any yellow spotting on the back near the mid-dorsal line is relatively indistinct and the front legs have well defined bands. Any markings on the rear legs, if present are indistinct.

Ctenophorus adelynhoserae sp. nov. in life is depicted in Storr *et al.* (1983), plate 3, image 4, adult male.

C. jackyhoserae sp. nov. is depicted in life in Wilson and Swan (2017) on page 413 at top left, adult male and Wilson and Knowles (1988), page 207, top left adult male, top right adult female and in Hoser (1989) page 67 top, male.

C. katrinahoserae sp. nov. is depicted in life online at: https://pbase.com/gehyra/image/129646530

(last downloaded on 1 March 2020).

C. lenhoseri sp. nov. is depicted in life in Cogger (2014), bottom left, adult male (aged) and Brown (2014), page 653 (3 images labelled as *Ctenophorus caudicinctus macropus*, Windorah, Queensland, two adult males and an adult female).

All of *Ctenophorus adelynhoserae sp. nov.*, *C. jackyhoserae sp. nov.*, *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov.* and *C. macropus* can be separated from all congeners in the subgenus *Tachyon* Wells and Wellington, 1985 (as defined elsewhere in this paper), by having over 32 lamellae under the fourth toe versus less than 32 in all other species as well as a tail 2 times the length of snout-vent, versus less than 1.8 times snout-vent in all other species and the adpressed hind-leg extends past the snout (not so in all other species).

All of *Ctenophorus adelynhoserae sp. nov.*, *C. jackyhoserae sp. nov.*, *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov.* and *C. macropus* are characterised as follows: Distal three-quarters of tail

compressed. Nasal small, located on top of obtuse rostral ridge. Keels of dorsal scales moderately strong and sharp, terminating in a blunt end or short spine. Ventrals weakly keeled. Upper labials 15-16. Femoral and preanal pores 26-31.

Distribution: *C. jackyhoserae sp. nov.* is known from the main part of the Kimberley division in Western Australia, including the north and east Kimberley, as well as nearby parts of immediately adjacent Northern Territory. The similar species *C. adelynhoserae sp. nov.* is known only from near the type locality of the Saint George Range and nearby ranges, (e.g. Edgar Ranges) south-west Kimberley Division of Western Australia, Australia.

Etymology: *C. jackyhoserae sp. nov.* is named in honour of my youngest daughter, Jacky Hoser, of Park Orchards, Victoria, Australia in recognition of over 18 years active work with wildlife conservation, research and education in Australia.

CTENOPHORUS* (*TACHYON*) *KATRINAHOSERAE SP. NOV.

LSID urn:lsid:zoobank.org:act:8137BF13-CB27-48AB-B0CB-F847CC8178D0

Holotype: A preserved specimen at the Museum and Art Gallery of the Northern Territory, Darwin, Northern Territory, Australia, specimen number NTM R25848 collected from 10 km south-east of the Roadhouse at Hells Gate, Queensland, Australia, Latitude -17.53 S., Longitude 138.40 E.

This government-owned facility allows access to its holdings.

Paratype: A preserved specimen at the Museum and Art Gallery of the Northern Territory, Darwin, Northern Territory, Australia, specimen number NTM R25847 collected from 10 km south-east of the Roadhouse at Hells Gate, Queensland, Australia, Latitude -17.53 S., Longitude 138.40 E.

Diagnosis: The species *Ctenophorus katrinahoserae sp. nov.* from far north-west Queensland and the nearby parts of the Northern Territory, south of the Gulf of Carpentaria, *C. lenhoseri sp. nov.* from the Selwyn Ranges (generally around Mount Isa and south of there), in north-west Queensland, *C. jackyhoserae sp. nov.* from the northern and eastern Kimberley division of Western Australia and immediately adjacent parts of the Northern Territory and *C. adelynhoserae sp. nov.* from the south-west Kimberley division of Western Australia (being the St. George and Edgar Ranges, north-east of Broome, Western Australia) have until now all been treated as populations of *C. macropus*

(Storr, 1967) with a distribution centred on Arnhem Land, Northern Territory, with which they are morphologically most similar to.

However all are morphologically distinct, wholly allopatric and sufficiently divergent to be treated as full species as is seen herein, with divergences estimated by Melville *et al.* (2016) to be in excess of 2.5 MYA for all but *C. lenhoseri sp. nov*. which was not inspected by Melville *et al*. (2016).
C. lenhoseri sp. nov. is however separated from the other species by a barrier of known antiquity in far north-west Queensland.

Ctenophorus adelynhoserae sp. nov., *C. jackyhoserae sp. nov.*, *C. katrinahoserae sp. nov*., *C. lenhoseri sp. nov.* and *C. macropus* are readily separated by their unique colour patterns.

Adult male *Ctenophorus adelynhoserae sp. nov.* are separated from males of the other species by having a brown dorsum and flanks with either no markings or indistinct ones. Legs are either unmarked or lack obvious markings, which otherwise may include indistinct spots or crossbands. There are scattered dark flecks or peppering along the lower sides and no light blue spots or flecks anywhere on the dorsum. Between the eye and ear is a dark and semi-distinct bar or broken bar. There are 19-21 tail rings, being alternating brown and whitish, the lighter sections being narrower than the darker sections.
Adult female *C. adelynhoserae sp. nov.* are greyish in colouration and with a greyish head with mottling as opposed to any well-defined markings.

Adult male *C. jackyhoserae sp. nov.* normally have a brownish-red dorsal surface with broken lines or evenly arranged flecks along, but not on the mid-dorsal line. Some specimens alternatively have a whitish-red upper body to deep red, characterised by a dorsal arrangement of about six broken orange-brown-red lines running longitudinally down the body from neck to rump, being broken by intervening areas of creamy-grey white that are wider than the darker markings. The side of the head and labials are whitish or at least with whiter pigment than elsewhere and with indistinct reddish markings near the ear and temples. The top of the head is a dark reddish orange, The lower flanks are characterised by 3-5 dark brown bars across a pale yellowish background, being indistinctly divided from the whitish-grey above, or in some specimens these may reduce to being evenly spaced paired dark spots. There are no light blue spots or flecks anywhere on the dorsum. There is no dark bar between the eye and ear, where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

There are 17-18 tail rings, alternating blackish and whitish, the rings being of even thickness.
Adult female *C. jackyhoserae sp. nov.* are of greyish colouration, featuring brown barring on the lower labial area, no markings, or very indistinct on all limbs and a dorsal surface featuring a mottled appearance of light and dark, but no obvious well defined pattern.

Adult male *C. lenhoseri sp. nov.* have a strongly reddish-brown forebody, becoming greyish towards the rear and tail. On either side of the mid-dorsal line are about 5 pairs of evenly spaced semi-distinct small dark blackish brown spots of semi-rectangular shape, the longer sides being those running towards the flanks. The flanks are more reddish than the mid dorsum, which is slightly greyish and the flanks also have scattered light blue spots or flecks. There are 24-28 tail rings, defined by having very narrow light sections and wide darker sections, being alternating brownish-black and whitish bands. There are no obvious blotches or spots on the lower flanks, or dark bar between the eye and ear, although in some specimens there is dark peppering where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

Adult female *C. lenhoseri sp. nov.* are of similar colour to males, being reddish and without obvious pattern of any sort. The dorsal surface is effectively unicolour, save for a poorly defined zone of darkening along the mid vertebral line and 4-6 well-spaced pairs of small but obvious yellow spots on either side of the mid dorsal line of the body. There are sometimes paired scattered dark spots around the neck, which typically fade in older specimens. There are 18-22 tail rings, with lighter ones being narrow or incomplete and darker ones about 3-4 times wider, the colouration being greyish orange (wider) and yellow (narrower) bands. Fore and hind limbs both have indistinct bands.

Juvenile *C. lenhoseri sp. nov.* of both sexes are characterised by a significant amount of dark brown and black pigment in the form of flecks or mottling on the upper surfaces, which fades with age.

Adult male *C. katrinahoserae sp. nov.* have an orange-grey-brown forebody, with a distinct salmon colouration across whitish parts of the upper forebody and head, becoming dull greyish towards the rear and tail. On either side of the mid-dorsal line are about scattered semi-distinct dark flecks which may also appear on the mid flanks, but the dorsum is otherwise not prominently marked. The flanks are slightly darker than the dorsum at the mid flanks before becoming light again at the belly. There are 20-26 tail rings, defined by having narrow light sections and wide darker sections, being alternating brownish-black and whitish bands. There are no obvious blotches or spots on the lower flanks, or dark bar between the eye and ear, although in some specimens there is dark peppering where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

Adult female *C. katrinahoserae sp. nov.* are of similar colour to males, but generally greyish in colour with lighter yellow-cream interspaces. There is a mottled pattern across the dorsal surface, being most prominent at the anterior end and the sides of the head.

In both sexes, the legs are generally unmarked, but commonly with indistinct blotching, particularly on the lower rear legs upper surface.

Adult male *C. macropus* have a generally light orange dorsal colour, with scattered dark brown flecks on the head and neck, but not on the body or legs. Prominent in this species are numerous bright aqua-blue spots scattered across the dorsal surface and sides of the flanks. There are 19-21 tail rings, with the darker sections being significantly wider than the lighter ones. The anterior tail is generally brownish orange with indistinct bands, while the posterior half of the tail has fairly well defined bands, the colours being brown and yellow-white.

Adult female *C. macropus* are similar in most respects to adult female *C. jackyhoserae sp. nov.* but any yellow spotting on the back near the mid-dorsal line is relatively indistinct and the front legs have well defined bands. Any markings on the rear legs, if present are indistinct.

Ctenophorus adelynhoserae sp. nov. in life is depicted in Storr *et al.* (1983), plate 3, image 4, adult male.

C. jackyhoserae sp. nov. is depicted in life in Wilson and Swan (2017) on page 413 at top left, adult male and Wilson and Knowles (1988), page 207, top left adult male, top right adult female and in Hoser (1989) page 67 top, male.

C. katrinahoserae sp. nov. is depicted in life online at: https://pbase.com/gehyra/image/129646530

(last downloaded on 1 March 2020).

C. lenhoseri sp. nov. is depicted in life in Cogger (2014), bottom left, adult male (aged) and Brown (2014), page 653 (3 images labelled as *Ctenophorus caudicinctus macropus*, Windorah, Queensland, two adult males and an adult female).

All of *Ctenophorus adelynhoserae sp. nov*., *C. jackyhoserae sp. nov*., *C. katrinahoserae sp. nov*., *C. lenhoseri sp. nov*. and *C. macropus* can be separated from all congeners in the subgenus *Tachyon* Wells and Wellington, 1985 (as defined elsewhere in this paper), by having over 32 lamellae under the fourth toe versus less than 32 in all other species as well as a tail 2 times the length of snout-vent, versus less than 1.8 times snout-vent in all other species and the adpressed hind-leg extends past the snout (not so in all other species).

All of *Ctenophorus adelynhoserae sp. nov*., *C. jackyhoserae sp. nov*., *C. katrinahoserae sp. nov*., *C. lenhoseri sp. nov*. and *C. macropus* are characterised as follows: Distal three-quarters of

tail compressed. Nasal small, located on top of obtuse rostral ridge. Keels of dorsal scales moderately strong and sharp, terminating in a blunt end or short spine. Ventrals weakly keeled. Upper labials 15-16. Femoral and preanal pores 26-31.

Distribution: *C. katrinahoserae sp. nov*. is known only from hilly country south of the Gulf of Carpentaria in far northwest Queensland and nearby parts of the Northern Territory, in an area generally bounded by Hells Gate in the East and Limmen National Park in the West.

C. macropus (Storr, 1967) inhabits the top end of the Northern Territory including Arnhem Land.

In the ranges surrounding Mount Isa and areas to the south, the species *C. lenhoseri sp. nov.* occurs.

Etymology: *C. katrinahoserae sp. nov*. is named in honour of my mother, Katrina Hoser, spending most of her life in the north side of Sydney, New South Wales, Australia in recognition of over 50 years of valuable contributions to herpetology in Australia and for services to the shoe retailing business globally.

CTENOPHORUS* (*TACHYON*) *LENHOSERI SP. NOV.

LSID urn:lsid:zoobank.org:act:524EFFEE-A159-4491-9960-DE3607193D56

Holotype: A preserved specimen at the Australian Museum, Sydney, New South Wales, Australia, specimen number R.26001 collected from Mount Isa in north-west Queensland, Australia, Latitude -20.73 S., Longitude 139.48 E. This government-owned facility allows access to its holdings.

Paratype: A preserved specimen at the Australian Museum, Sydney, New South Wales, Australia, specimen number R.72760 collected from Mount Isa in north-west Queensland, Australia, Latitude -20.73 S., Longitude 139.48 E.

Diagnosis: The species *Ctenophorus lenhoseri sp. nov*. from the Selwyn Ranges (generally around Mount Isa and south of there), in north-west Queensland, *C. katrinahoserae sp. nov.* from far north-west Queensland and the nearby parts of the Northern Territory, south of the Gulf of Carpentaria, *C. jackyhoserae sp. nov.* from the northern and eastern Kimberley division of Western Australia and immediately adjacent parts of the Northern Territory and *C. adelynhoserae sp. nov*. from the south-west Kimberley division of Western Australia (being the St. George and Edgar Ranges, north-east of Broome, Western Australia) have until now all been treated as populations of *C. macropus* (Storr, 1967) with a distribution centred on Arnhem Land, Northern Territory, with which they are morphologically most similar to.

However all are morphologically distinct, wholly allopatric and sufficiently divergent to be treated as full species as is seen herein, with divergences estimated by Melville *et al.* (2016) to be in excess of 2.5 MYA for all but *C. lenhoseri sp. nov*. which was not inspected by Melville *et al.* (2016).
C. lenhoseri sp. nov. is however separated from the other species by a barrier of known antiquity in far north-west Queensland.

Ctenophorus adelynhoserae sp. nov., *C. jackyhoserae sp. nov.*, *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov.* and *C. macropus* are readily separated by their unique colour patterns.

Adult male *Ctenophorus adelynhoserae sp. nov.* are separated from males of the other species by having a brown dorsum and flanks with either no markings or indistinct ones. Legs are either unmarked or lack obvious markings, which otherwise may include indistinct spots or crossbands. There are scattered dark flecks or peppering along the lower sides and no light blue spots or flecks anywhere on the dorsum. Between the eye and ear is a dark and semi-distinct bar or broken bar. There are 19-21 tail rings, being alternating brown and whitish, the lighter sections being narrower than the darker sections.
Adult female *C. adelynhoserae sp. nov.* are greyish in colouration and with a greyish head with mottling as opposed to any well-defined markings.

Adult male *C. jackyhoserae sp. nov.* normally have a brownish-red dorsal surface with broken lines or evenly arranged flecks along, but not on the mid-dorsal line. Some specimens alternatively have a whitish-red upper body to deep red, characterised by a dorsal arrangement of about six broken orange-brown-red lines running longitudinally down the body from neck to rump, being broken by intervening areas of creamy-grey white that are wider than the darker markings. The side of the head and labials are whitish or at least with whiter pigment than elsewhere and with indistinct reddish markings near the ear and temples. The top of the head is a dark reddish orange, The lower flanks are characterised by 3-5 dark brown bars across a pale yellowish background, being indistinctly divided from the whitish-grey above, or in some specimens these may reduce to being evenly spaced paired dark spots. There are no light blue spots or flecks anywhere on the dorsum. There is no dark bar between the eye and ear, where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

There are 17-18 tail rings, alternating blackish and whitish, the rings being of even thickness.
Adult female *C. jackyhoserae sp. nov.* are of greyish colouration, featuring brown barring on the lower labial area, no markings, or very indistinct on all limbs and a dorsal surface featuring a mottled appearance of light and dark, but no obvious well defined pattern.

Adult male *C. lenhoseri sp. nov.* have a strongly reddish-brown forebody, becoming greyish towards the rear and tail. On either side of the mid-dorsal line are about 5 pairs of evenly spaced semi-distinct small dark blackish brown spots of semi-rectangular shape, the longer sides being those running towards the flanks. The flanks are more reddish than the mid dorsum, which is slightly greyish and the flanks also have scattered light blue spots or flecks. There are 24-28 tail rings, defined by having very narrow light sections and wide darker sections, being alternating brownish-black and whitish bands. There are no obvious blotches or spots on the lower flanks, or dark bar between the eye and ear, although in some specimens there is dark peppering where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

Adult female *C. lenhoseri sp. nov.* are of similar colour to males, being reddish and without obvious pattern of any sort. The dorsal surface is effectively unicolour, save for a poorly defined zone of darkening along the mid vertebral line and 4-6 well-spaced pairs of small but obvious yellow spots on either side of the mid dorsal line of the body. There are sometimes paired scattered dark spots around the neck, which typically fade in older specimens. There are 18-22 tail rings, with lighter ones being narrow or incomplete and darker ones about 3-4 times wider, the colouration being greyish orange (wider) and yellow (narrower) bands. Fore and hind limbs both have indistinct bands.

Juvenile *C. lenhoseri sp. nov.* of both sexes are characterised by a significant amount of dark brown and black pigment in the form of flecks or mottling on the upper surfaces, which fades with age.

Adult male *C. katrinahoserae sp. nov.* have an orange-grey-brown forebody, with a distinct salmon colouration across whitish parts of the upper forebody and head, becoming dull greyish towards the rear and tail. On either side of the mid-dorsal line are about scattered semi-distinct dark flecks which may also appear on the mid flanks, but the dorsum is otherwise not prominently marked. The flanks are slightly darker than the dorsum at the mid flanks before becoming light again at the belly. There are 20-26 tail rings, defined by having narrow light sections and wide darker sections, being alternating brownish-black and whitish bands. There are no obvious blotches or spots on the lower flanks, or dark bar between the eye and ear, although in some specimens there is dark peppering where the stripe would otherwise be seen in *Ctenophorus adelynhoserae sp. nov.*.

Adult female *C. katrinahoserae sp. nov.* are of similar colour to males, but generally greyish in colour with lighter yellow-cream interspaces. There is a mottled pattern across the dorsal surface, being most prominent at the anterior end and the sides of the head.

In both sexes, the legs are generally unmarked, but commonly with indistinct blotching, particularly on the lower rear legs upper

surface.

Adult male *C. macropus* have a generally light orange dorsal colour, with scattered dark brown flecks on the head and neck, but not on the body or legs. Prominent in this species are numerous bright aqua-blue spots scattered across the dorsal surface and sides of the flanks. There are 19-21 tail rings, with the darker sections being significantly wider than the lighter ones. The anterior tail is generally brownish orange with indistinct bands, while the posterior half of the tail has fairly well defined bands, the colours being brown and yellow-white.

Adult female *C. macropus* are similar in most respects to adult female *C. jackyhoserae sp. nov.* but any yellow spotting on the back near the mid-dorsal line is relatively indistinct and the front legs have well defined bands. Any markings on the rear legs, if present are indistinct.

Ctenophorus adelynhoserae sp. nov. in life is depicted in Storr *et al*. (1983), plate 3, image 4, adult male.

C. jackyhoserae sp. nov. is depicted in life in Wilson and Swan (2017) on page 413 at top left, adult male and Wilson and Knowles (1988), page 207, top left adult male, top right adult female and in Hoser (1989) page 67 top, male.

C. katrinahoserae sp. nov. is depicted in life online at: https://pbase.com/gehyra/image/129646530

(last downloaded on 1 March 2020).

C. lenhoseri sp. nov. is depicted in life in Cogger (2014), bottom left, adult male (aged) and Brown (2014), page 653 (3 images labelled as *Ctenophorus caudicinctus macropus*, Windorah, Queensland, two adult males and an adult female).

All of *Ctenophorus adelynhoserae sp. nov*., *C. jackyhoserae sp. nov*., *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov*. and *C. macropus* can be separated from all congeners in the subgenus *Tachyon* Wells and Wellington, 1985 (as defined elsewhere in this paper), by having over 32 lamellae under the fourth toe versus less than 32 in all other species as well as a tail 2 times the length of snout-vent, versus less than 1.8 times snout-vent in all other species and the adpressed hind-leg extends past the snout (not so in all other species).

All of *Ctenophorus adelynhoserae sp. nov*., *C. jackyhoserae sp. nov*., *C. katrinahoserae sp. nov.*, *C. lenhoseri sp. nov*. and *C. macropus* are characterised as follows: Distal three-quarters of tail compressed. Nasal small, located on top of obtuse rostral ridge. Keels of dorsal scales moderately strong and sharp, terminating in a blunt end or short spine. Ventrals weakly keeled. Upper labials 15-16. Femoral and preanal pores 26-31.

Distribution: The species *C. lenhoseri sp. nov.* occurs in the ranges surrounding Mount Isa and areas to the south in north-west Queensland.

C. katrinahoserae sp. nov. is known only from hilly country south of the Gulf of Carpentaria in far northwest Queensland and nearby parts of the Northern Territory, in an area generally bounded by Hells Gate in the East and Limmen National Park in the West.

C. macropus (Storr, 1967) inhabits the top end of the Northern Territory including Arnhem Land.

Etymology: *C. lenhoseri sp. nov.* is named in honour of my father, Len Hoser (AKA Leonard Donald Hoser), spending about half of his life living in the north side of Sydney, New South Wales, Australia and the other half in the United Kingdom of England, Wales, Scotland and Northern Ireland in recognition of over three decades of valuable contributions to herpetology in Australia and for services to the bakery business in Australia and the UK.

CTENOPHORUS* (*TACHYON*) *MAXINEHOSERAE SP. NOV.

LSID urn:lsid:zoobank.org:act:EB5ADF71-70FB-45A9-B989-5C107063D718

Holotype: A preserved specimen at the National Museum of Victoria, Melbourne, Victoria, Australia, specimen number D74268 collected from Devils Marbles, Northern Territory, Australia, Latitude -20.5676, Longitude 134.264 E. This facility allows access to its holdings.

Paratype: A preserved specimen at the Museum and Art Gallery of the Northern Territory, Reptile Collection, Darwin, Northern Territory, Australia, specimen number R31309 collected from Devils Marbles, Northern Territory, Australia, Latitude -20.55, Longitude 134.283 E.

Diagnosis: Until now *Ctenophorus maxinehoserae sp. nov.* has been treated as a northern population of *C. slateri* (Storr, 1967), the latter species with a type locality of Hermannsburg, Northern Territory, Australia, Latitude 23.58 S., Longitude 132.46 E.
C. slateri as defined herein is effectively confined to the Macdonnell Ranges of Central Australia.
However genetic divergence and morphological differences, combined with a clearly allopatric population indicate that the lizards herein identified as *Ctenophorus maxinehoserae sp. nov.* found to the north of the type region of *C. slateri* are not of the same species as *C. slateri* (Storr, 1967).

Both *C. maxinehoserae sp. nov.* and *C. slateri* are readily separated from all other species in the subgenus *Tachyon* (Wells and Wellington, 1985) (as defined elsewhere in this paper) by the following unique suite of characters: Keels of dorsal scales sharp and black (versus not so in all other species), the adpressed hind-leg does not extend to the end of the snout, which clearly separates this species from all of *Ctenophorus adelynhoserae sp. nov*., *C. jackyhoserae sp. nov*., *C. katrinahoserae sp. nov*., *C. lenhoseri sp. nov*. and *C. macropus* (Storr, 1967) (these species all previously treated as populations of *C. macropus*), base of tail not compressed; there are no dark blackish caudal bands, nasal on or just below a swollen rostral ridge: pores fewer than 43, colouration with a dorsal surface that is reddish-brown or dull orange, with small indistinct, whitish or darkish specks, spots or small blotches. Tail rings are semidistinct at the anterior end and fully formed at the rear, with darker sections 3-5 times wider, and a colouration of alternating greyish orange and yellowish white bands.

Both male and female *C. maxinehoserae sp. nov.* are readily separated from *C. slateri* by having a series of 6-7 small semi-distinct dark purplish-brown spots running along either side of the mid dorsal line of the body with further similarly-spaced similar markings extending to the upper surface of the base of the tail. Both male and female *C. slateri* are characterised by having a series of well-defined white to whitish yellow spots running along either side of the mid dorsal line of the body with further similarly-spaced similar but less distinct markings extending to the upper surface of the base of the tail.

C. maxinehoserae sp. nov. is further separated from *C. slateri* by having weakly keeled ventral scales, versus not so in *C. slateri.*

C. maxinehoserae sp. nov. in life is depicted in Wilson and Knowles (1988), on page 206 bottom right, adult male, and Brown (2014), page 653, bottom left.

C. slateri in life is depicted in Brown (2014) on page 653 bottom right, adult female.

Distribution: *C. maxinehoserae sp. nov.* is restricted to ranges and rocky country in the general vicinity of Barrow Creek to Tennant Creek, including the Davenport Ranges in the Northern Territory, Australia, while *C. slateri* is confined to the Macdonnell Ranges and nearby rocky hills in Central Australia.

Etymology: Named in honour of Maxine Hoser of Margate in the United Kingdom of England, Wales, Scotland and Northern Ireland in recognition of her services to herpetology from the 1960's to 1980's.

CTENOPHORUS* (*TACHYON*) *RONHOSERI SP. NOV.

LSID urn:lsid:zoobank.org:act:6BA8B610-14A6-40B6-A681-E7F0AD96F3A8

Holotype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number R102084, collected from the Yulpul Rockhole at the north end of the McKay Range, Western Australia, Australia, Latitude -22.97 S., Longitude 122.46 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 R102611, collected from the Little Sandy Desert, Western Australia, Australia, Latitude -24.05 S., Longitude 120.41 E.

Diagnosis: Morphologically, *Ctenophorus ronhoseri sp. nov.* is most similar to *C. caudicinctus* (Günther, 1875), although genetically it is most closely related to *C. graafi* (Storr, 1967). However the species is sufficiently divergent from all congeners (4.2 MYA from nearest common ancestor according to the evidence of Melville *et al.* 2016), morphologically distinct and reproductively isolated as to warrant being recognized as a full species.

Ctenophorus ronhoseri sp. nov. and *C. caudicinctus* are separated from all other species in the subgenus *Tachyon* (Wells and Wellington) as defined elsewhere in this paper, including the closely related species *C. graafi* (Storr, 1967) by having the nasal on or just below a swollen rostral ridge: pores fewer than 43 and the whole of tail compressed with dark narrow caudal bands encircling the tail.

C. ronhoseri sp. nov. is readily separated from *C. caudicinctus* by having yellowish or orangeish colouration on the back, versus reddish or brown on *C. caudicinctus.* Markings on the back and flanks of adult male *C. ronhoseri sp. nov.* are indistinct, versus distinct in *C. caudicinctus.*

C. caudicinctus also has white marks or peppering on the sides of the head, whereas this is not the case in *C. ronhoseri sp. nov.*.

Distribution: *C. ronhoseri sp. nov.* is known only from the type localities and immediately adjacent hilly areas in the east Pilbara region of Western Australia, Australia.
C. caudicinctus is found in other parts of the Pilbara, including the west Pilbara

Etymology: Named in honour of Ron Hoser, (deceased) of Green Valley, (Sydney), New South Wales, Australia in recognition of numerous contributions to herpetology in the 1960's to 1980's.

CTENOPHORUS* (*TACHYON*) *SHARONHOSERAE SP. NOV.

LSID urn:lsid:zoobank.org:act:2FC73FDD-6F04-41F3-91D6-3676BB32C04B

Holotype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number: R12734, collected at Dedari, (Coolgardie), Western Australia, Australia, Latitude -31.08 S., Longitude 120.77 E. This government-owned facility allows access to its holdings.

Paratypes: Two preserved specimens at the Western Australian Museum, Perth, Western Australia, Australia, specimen numbers R29946 and R29947 collected at Widgiemooltha, Western Australia, Australia, Latitude -31.3 S., Longitude 121.58 E.

Diagnosis: Until now *C. sharonhoserae sp. nov.* has been treated as an inland eastern population of *C. ornatus* (Gray, 1845) with a distribution mainly in the Goldfields region of southern Western Australia, Australia.

These two species and third species formally described herein as *C. shireenhoserae sp. nov.* are readily separated by colouration in adult males.

The type form of *C. ornatus* has a generally black dorsal surface with large creamy-white blotches running down the mid-dorsal line and a lesser number of smaller spots on the flanks. The tail has well defined black and yellow-white bands (sometimes uneven) of similar thickness on the dorsal surface and blackish limbs that are strongly banded or marked with yellow-white.
By contrast *C. shireenhoserae sp. nov.* has a generally reddish-brown dorsal surface with an absence of yellow spots on the side. The colour of the mid dorsal blotches is whitish-grey, generally merging to form a mid-dorsal stripe and bounded by dark brown to black. The limbs are generally a light greyish colour and with ill defined blotches or markings. The tail of *C. shireenhoserae sp. nov.* is banded but the lighter interspaces are double the size of the darker sections. The lighter bands are light bluish-grey, versus white to fellow-white in *C. ornatus.*

C. sharonhoserae sp. nov. is separated from both *C. shireenhoserae sp. nov.* and *C. ornatus* by colouration. In this species the mid dorsal blotches are similar in form to those seen in *C. ornatus* including being bounded by black. But unlike *C. ornatus* that has a generally black dorsum and flanks with some obvious yellow spots, *C. sharonhoserae sp. nov.* has a reddish brown dorsum and flanks, with a distinctive line boundary between the reddish brown dorsum and white undersides. At most there are only a small number of very tiny whitish yellow specks on the lower flanks and the mid flanks have no such markings, being either dark or light reddish-brown in colour.
In *C. sharonhoserae sp. nov.* the forelimbs are well-banded and the hind limbs are not, which places this taxon intermediate between *C. shireenhoserae sp. nov.* whose limbs lack obvious distinct bands and *C. ornatus* which has well banded front and hind limbs.

The species *C. shireenhoserae sp. nov.* is in many ways intermediate in form between *C. ornatus* and *C. yinnietherra* (Storr, 1981). *C. yinnietherra* is separated from *C. shireenhoserae sp. nov.*, *C. sharonhoserae sp. nov.* and *C. ornatus* by having the basal portion of the tail unbanded and only banding on the posterior third. *C. yinnietherra* is further separated from both *C. shireenhoserae sp. nov.*, *C. sharonhoserae sp. nov.* and *C. ornatus* by dorsal colouration. The flanks are generally greyish, without obvious markings, forelimbs also greyish and mid-dorsal area and rear limbs generally reddish-orange and without any obvious black markings or black bounding any blotches or spots (which are absent). The anterior half of the tail has an orange upper surface (without bands), versus not orangeish and banded in the other three species.

C. yinnietherra is further separated from *C. shireenhoserae sp. nov.*, *C. sharonhoserae sp. nov.* and *C. ornatus* by having a significant amount of orange around the eye and nearby parts of the head (absent in the other two species).

Adult female *C. yinnietherra* have a generally unbanded tail, versus banded in females of *C. shireenhoserae sp. nov.*, *C. sharonhoserae sp. nov.* and *C. ornatus.* Adult female *C. shireenhoserae sp. nov.* and *C. sharonhoserae sp. nov.* are generally a reddish-brown dorsally with semi-distinct irregular blackish markings, versus greyish-brown dorsally with semi-distinct irregular blackish markings in *C. ornatus.*

C. shireenhoserae sp. nov. in life is depicted in Cogger (2014) on page 716 at top right; Storr, Smith and Johnstone (1983) middle right and in Brown (2014) on page 656 at bottom left (with caption transposed from photo of *C. ornatus* in middle right of same page).

C. ornatus in life is depicted in Cogger (2014) on page 717 at top left; Storr, Smith and Johnstone (1983) top right and left and in Brown (2014) on page 656 at middle right (with caption transposed from photo of *shireenhoserae sp. nov.* in bottom left of same page).

C. sharonhoserae sp. nov. in life is depicted in Storr, Smith and Johnstone (1983) middle left.

C. yinnietherra in life is depicted in Cogger (2014) on page 724 at top and Storr, Smith and Johnstone (1983), bottom right and left.

The type specimen of *C. ornatus* as described by Boulenger (1885), as described by him in terms of colouration, clearly conforms to a male specimen from the wetter parts of South-western Western Australia (as in somewhere near Perth) and so that form is regarded as nominate for *C. ornatus*, thereby confirming the taxon herein described as *C. shireenhoserae sp. nov.* was previously undescribed.
In terms of colouration, Boulenger wrote: "Black above; a series of large irregular yellowish spots along the vertebral line and a few very small ones scattered on the sides; limbs and tail with yellowish cross bars; throat punctate with blackish; a large black spot covers the chest."

Boulenger's full description of the type specimen for Gray's *C. ornatus* was as follows:
"Habit slender. Head moderately large; snout slightly longer

than the diameter of the orbit; canthus rostralis swollen, not angular ; nostril distinctly tubular, directed slightly upwards, much nearer the eye than the end of the snout ; tympanum large, three fifths the diameter of the orbit ; upper head-scales tubercular, rough, smallest on supraorbital region. Sides of neck rather strongly plicate a distinct dorso-lateral fold. Gular scales minute, smooth. Body much depressed, covered above with small keeled scales, largest and uniform on the vertebral region, minute and intermixed with widely scattered slightly enlarged ones on the sides; no dorsal crest; ventral scales small, smooth. Limbs and digits long, the adpressed hind limb reaching the tip of the snout; the scales on the limbs strongly keeled, those on the arm and tibia much enlarged.

A series of sixty pores extending along the whole length of the thighs, slightly interrupted on the praeanal region. Tail slender, round, depressed at the base; twice as long as head and body;

caudal scales equal, much larger than dorsals, strongly keeled.

Blackish above; a series of large irregular yellowish spots along the vertebral line and a few very small ones scattered on the sides; limbs and tail with yellowish cross bars; throat punctate with

blackish; a large black spot covers the chest."

Species within the subgenus *Tachyon* Wells and Wellington, 1985 are separated from all other *Ctenophorus* Fitzinger, 1843 by the following suite of characters being one or other of:

1/ Tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb usually reaching to eye or beyond when adpressed; tail usually much more than 1.5 times as long as the head and body; canthus rostralis swollen, but nostrils, when viewed from above, face distinctly upwards as opposed to outwards (species *C. adelynhoserae sp. nov.*; *C. caudicinctus* (Günther, 1875); *C. graafi* (Storr, 1967); *C. imbricatus* (Peters, 1876); *C. infans* (Storr, 1967); *C. jackyhoserae sp. nov.*; *C. katrinahoserae sp. nov.*; *C. lenhoseri sp. nov.*; *C. macropus* (Storr, 1967); *C. mensarum* (Storr, 1967); *C. slateri* (Storr, 1967)) or:

2/ Tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb usually reaching to eye or beyond when adpressed; tail usually much more than 1.5 times as long as the head and body; canthus rostralis angular or moderately swollen, but nostrils, when viewed from above, face outwards as opposed to distinctly upwards (as seen in the species *C. adelynhoserae sp. nov.*; *C. caudicinctus* (Günther, 1875); *C. graafi* (Storr, 1967); *C. imbricatus* (Peters, 1876); *C. infans* (Storr, 1967); *C. jackyhoserae sp. nov.*; *C. katrinahoserae sp. nov.*; *C. lenhoseri sp. nov.*; *C. macropus* (Storr, 1967); *C. mensarum* (Storr, 1967); *C. slateri* (Storr, 1967)); at most a few enlarged keeled scales on the nape; a series of enlarged vertebral scales, if present, forming a distinct linear series only to about the level of the forelimbs; dorsal scales at most with low,

irregular keels which do not form distinct continuous ridges; dorsolateral scales and those on the chest smooth, or with low blunt edges; nostril elliptical in a swollen nasal scale lying on a swollen canthal ridge; tibial region with a series of anterior proximal scales which are very much larger than those on the posterior surface (species *C. shireenhoserae sp. nov.*; *C. ornatus* and *C. yinnietharra*).

Ctenophorus as defined until now (Cogger 2014, Hoser 2015g) is defined by the following definition, modified to take into account the new genera as defined herein. *Ctenophorus* is defined as an Australian agamid genus characterised by small dorsal scales, homogenous or with at most slightly enlarged tubercles; a few species with distinct rows of paravertebral or dorsolateral spinose scales; a row of enlarged scales from below the eye to above the ear; tympanum exposed (not exposed in *Notactenophorus* Hoser, 2015 and most *Pseudoctenophorus* Hoser, 2015); tail long, ranging from slightly to much longer than the head and body; femoral and preanal pores present in males; adult males usually with distinctive black or dark grey markings on the throat and/or chest.

The genus *Paractenophorus* Hoser, 2015 is separated from *Ctenophorus*, *Notactenophorus* Hoser, 2015 and *Pseudoctenophorus* Hoser, 2015 by the following suite of characters: tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb reaching no further than the tympanum when adpressed; tail usually less than 1.5 times as long as the head and body; nasal region is not swollen, the nostril lying below an angular canthal ridge; pores fewer than 15; nostril is slit-like or narrowly elliptical.

Specimens within the genus *Pseudoctenophorus* Hoser, 2015 are separated from all other *Ctenophorus* Fitzinger, 1843, the genus they were placed previously, by the following suite of characters, being one or other of the following three:

1/ Tympanum exposed; a series of enlarged, spinose scales on either side of the base of the tail (subgenus *Pseudoctenophorus* Hoser, 2015), or:

2/ Tympanum hidden; covered by skin; body scales are strongly heterogeneous, many of the larger scales on the body and head keeled or moderately spinose; a series of enlarged, spinose scales on either side of the base of the tail (subgenus *Chapmanagama* Hoser, 2015), or:

3/ Tympanum hidden; covered by skin; body scales are strongly heterogeneous, many of the larger scales on the body and head keeled or moderately spinose; no series of enlarged, spinose scales on either side of the base of the tail (subgenus *Turnbullagama* Hoser, 2015).

Notactenophorus Hoser, 2015 is readily separated from all other members of the genus *Ctenophorus* (where it has been placed until now, as defined in Cogger 2014) and *Pseudoctenophorus* Hoser, 2015 by the following unique suite of characters: Tympanum is hidden being covered by skin, the body scales are smooth, mostly small, homogenous, with scattered larger but small, flat scales, not keeled or spinose, with a dorsal pattern of a longitudinal dorso-lateral series of five or six large black spots on either side.

Distribution: *C. sharonhoserae sp. nov.* is found in the semi-arid zone of south-western Western Australia, away from the Darling Range and south coast of Western Australia, and also south of the mulga-eucalypt line in south-west Australia. The distribution is mainly in the Goldfields region of southern Western Australia, Australia.

C ornatus is restricted to the Darling Range (near Perth) and wetter parts of the south coast of south-western Australia.

C. shireenhoserae sp. nov. is known only from near the type locality and nearby areas in Western Australia, generally between Paynes Find and Mount Magnet in Western Australia.

Etymology: *C. sharonhoserae sp. nov.* is named in honour of my cousin Sharon Hoser (now Menzies), originally of the UK, but since having resided in various capital cities of Australia and also in Papua New Guinea in recognition of her contributions to herpetology in the 1960's and 1970's.

CTENOPHORUS* (*TACHYON*) *SHIREENHOSERAE SP. NOV.

LSID urn:lsid:zoobank.org:act:D6B994AC-026E-4285-9F46-51CB695A73BB

Holotype: A preserved specimen at the Western Australian Museum, Perth, Western Australia, Australia, specimen number: R117278 collected 7 km north of Mount Magnet, Western Australia, Latitude -28 S., Longitude 117.87 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: R117279 collected 7 km north of Mount Magnet, Western Australia, Latitude -28 S., Longitude 117.87 E.

Diagnosis: Until now *C. shireenhoserae sp. nov.* has been treated as a north-west population of *C. ornatus* (Gray, 1845).

These two species and third species formally described herein as

C. sharonhoserae sp. nov. are readily separated by colouration in adult males.

The type form of *C. ornatus* has a generally black dorsal surface with large creamy-white blotches running down the mid-dorsal line and a lesser number of smaller spots on the flanks. The tail has well defined black and yellow-white bands (sometimes uneven) of similar thickness on the dorsal surface and blackish limbs that are strongly banded or marked with yellow-white.
By contrast *C. shireenhoserae sp. nov*. has a generally reddish-brown dorsal surface with an absence of yellow spots on the side. The colour of the mid dorsal blotches is whitish-grey, generally merging to form a mid-dorsal stripe and bounded by dark brown to black. The limbs are generally a light greyish colour and with ill defined blotches or markings. The tail of *C. shireenhoserae sp. nov*. is banded but the lighter interspaces are double the size of the darker sections. The lighter bands are light bluish-grey, versus white to fellow-white in *C. ornatus*.

C. sharonhoserae sp. nov. is separated from both *C. shireenhoserae sp. nov*. and *C. ornatus* by colouration. In this species the mid dorsal blotches are similar in form to those seen in *C. ornatus* including being bounded by black. But unlike *C. ornatus* that has a generally black dorsum and flanks with some obvious yellow spots, *C. sharonhoserae sp. nov.* has a reddish brown dorsum and flanks, with a distinctive line boundary between the reddish brown dorsum and white undersides. At most there are only a small number of very tiny whitish yellow specks on the lower flanks and the mid flanks have no such markings, being either dark or light reddish-brown in colour.
In *C. sharonhoserae sp. nov.* the forelimbs are well-banded and the hind limbs are not, which places this taxon intermediate between *C. shireenhoserae sp. nov*. whose limbs lack obvious distinct bands and *C. ornatus* which has well banded front and hind limbs..

The species *C. shireenhoserae sp. nov*. is in many ways intermediate in form between *C. ornatus* and *C. yinnietherra* (Storr, 1981). *C. yinnietherra* is separated from *C. shireenhoserae sp. nov*., *C. sharonhoserae sp. nov.* and *C. ornatus* by having the basal portion of the tail unbanded and only banding on the posterior third. *C. yinnietherra* is further separated from both *C. shireenhoserae sp. nov*., *C. sharonhoserae sp. nov.* and *C. ornatus* by dorsal colouration. The flanks are generally greyish, without obvious markings, forelimbs also greyish and mid-dorsal area and rear limbs generally reddish-orange and without any obvious black markings or black bounding any blotches or spots (which are absent). The anterior half of the tail has an orange upper surface (without bands), versus not orangeish and banded in the other three species.

C. yinnietherra is further separated from *C. shireenhoserae sp. nov*., *C. sharonhoserae sp. nov.* and *C. ornatus* by having a significant amount of orange around the eye and nearby parts of the head (absent in the other two species).

Adult female *C. yinnietherra* have a generally unbanded tail, versus banded in females of *C. shireenhoserae sp. nov*., *C. sharonhoserae sp. nov*. and *C. ornatus.* Adult female *C. shireenhoserae sp. nov*. and *C. sharonhoserae sp. nov.* are generally a reddish-brown dorsally with semi-distinct irregular blackish markings, versus greyish-brown dorsally with semi-distinct irregular blackish markings in *C. ornatus.*

C. shireenhoserae sp. nov. in life is depicted in Cogger (2014) on page 716 at top right; Storr, Smith and Johnstone (1983) middle right and in Brown (2014) on page 656 at bottom left (with caption transposed from photo of *C. ornatus* in middle right of same page).

C. ornatus in life is depicted in Cogger (2014) on page 717 at top left; Storr, Smith and Johnstone (1983) top right and left and in Brown (2014) on page 656 at middle right (with caption transposed from photo of *shireenhoserae sp. nov*. in bottom left of same page).

C. sharonhoserae sp. nov. in life is depicted in Storr, Smith and Johnstone (1983) middle left.

C. yinnietherra in life is depicted in Cogger (2014) on page 724 at top and Storr, Smith and Johnstone (1983), bottom right and left.

The type specimen of *C. ornatus* as described by Boulenger (1885), as described by him in terms of colouration, clearly conforms to a male specimen from the wetter parts of South-western Western Australia (as in somewhere near Perth) and so that form is regarded as nominate for *C. ornatus*, thereby confirming the taxon herein described as *C. shireenhoserae sp. nov*. was previously undescribed.
In terms of colouration, Boulenger wrote: “Black above; a series of large irregular yellowish spots along the vertebral line and a few very small ones scattered on the sides; limbs and tail with yellowish cross bars; throat punctate with blackish; a large black spot covers the chest.”

Boulenger’s full description of the type specimen for Gray’s *C. ornatus* was as follows:
“Habit slender. Head moderately large; snout slightly longer than the diameter of the orbit; canthus rostralis swollen, not angular ; nostril distinctly tubular, directed slightly upwards, much nearer the eye than the end of the snout ; tympanum large, three fifths the diameter of the orbit ; upper head-scales tubercular, rough, smallest on supraorbital region. Sides of neck rather strongly plicate a distinct dorso-lateral fold. Gular scales minute, smooth. Body much depressed, covered above with small keeled scales, largest and uniform on the vertebral region, minute and intermixed with widely scattered slightly enlarged ones on the sides; no dorsal crest; ventral scales small, smooth. Limbs and digits long, the adpressed hind limb reaching the tip of the snout; the scales on the limbs strongly keeled, those on the arm and tibia much enlarged.

A series of sixty pores extending along the whole length of the thighs, slightly interrupted on the praeanal region. Tail slender, round, depressed at the base; twice as long as head and body;

caudal scales equal, much larger than dorsals, strongly keeled.

Black above; a series of large irregular yellowish spots along the vertebral line and a few very small ones scattered on the sides; limbs and tail with yellowish cross bars; throat punctate with

blackish; a large black spot covers the chest.”

Species within the subgenus *Tachyon* Wells and Wellington, 1985 are separated from all other *Ctenophorus* Fitzinger, 1843 by the following suite of characters being one or other of:

1/ Tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb usually reaching to eye or beyond when adpressed; tail usually much more than 1.5 times as

long as the head and body; canthus rostralis swollen, but nostrils, when viewed from above, face distinctly upwards as opposed to outwards (species *C. adelynhoserae sp. nov*.; *C. caudicinctus* (Günther, 1875); *C. graafi* (Storr, 1967); *C. imbricatus* (Peters, 1876); *C. infans* (Storr, 1967); *C. jackyhoserae sp. nov.*; *C. katrinahoserae sp. nov.*; *C. lenhoseri sp. nov.*; *C. macropus* (Storr, 1967); *C. mensarum* (Storr, 1967); *C. slateri* (Storr, 1967)) or:

2/ Tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb usually reaching to eye or beyond when adpressed; tail usually much more than 1.5 times as long as the head and body; canthus rostralis angular or moderately swollen, but nostrils, when viewed from above, face outwards as opposed to distinctly upwards (as seen in the species *C. adelynhoserae sp. nov*.; *C. caudicinctus* (Günther, 1875); *C. graafi* (Storr, 1967); *C. imbricatus* (Peters, 1876); *C. infans* (Storr, 1967); *C. jackyhoserae sp. nov*.; *C. katrinahoserae sp. nov*.; *C. lenhoseri sp. nov*.; *C. macropus* (Storr, 1967); *C. mensarum* (Storr, 1967); *C. slateri* (Storr, 1967));

at most a few enlarged keeled scales on the nape; a series of enlarged vertebral scales, if present, forming a distinct linear series only to about the level of the forelimbs; dorsal scales at most with low,

irregular keels which do not form distinct continuous ridges; dorsolateral scales and those on the chest smooth, or with low blunt edges; nostril elliptical in a swollen nasal scale lying on a swollen canthal ridge; tibial region with a series of anterior proximal scales which are very much larger than those on the posterior surface (species *C. shireenhoserae sp. nov.*; *C. ornatus* and *C. yinnietharra*).

Ctenophorus as defined until now (Cogger 2014, Hoser 2015g) is defined by the following definition, modified to take into account the new genera as defined herein. *Ctenophorus* is defined as an Australian agamid genus characterised by small dorsal scales, homogenous or with at most slightly enlarged tubercles; a few species with distinct rows of paravertebral or dorsolateral spinose scales; a row of enlarged scales from below the eye to above the ear; tympanum exposed (not exposed in *Notactenophorus* Hoser, 2015 and most *Pseudoctenophorus* Hoser, 2015); tail long, ranging from slightly to much longer than the head and body; femoral and preanal pores present in males; adult males usually with obvious black or dark grey markings on throat and/or chest.

The genus *Paractenophorus* Hoser, 2015 is separated from *Ctenophorus*, *Notactenophorus* Hoser, 2015 and *Pseudoctenophorus* Hoser, 2015 by the following suite of characters: tympanum exposed; no series of enlarged, spinose scales on either side of the base of the tail; hind limb reaching no further than the tympanum when adpressed; tail usually less than 1.5 times as long as the head and body; nasal region is not swollen, the nostril lying below an angular canthal ridge; pores fewer than 15; nostril is slit-like or narrowly elliptical.

Specimens within the genus *Pseudoctenophorus* Hoser, 2015 are separated from all other *Ctenophorus* Fitzinger, 1843, the genus they were placed previously, by the following suite of characters, being one or other of the following three:

1/ Tympanum exposed; a series of enlarged, spinose scales on either side of the base of the tail (subgenus *Pseudoctenophorus* Hoser, 2015), or:

2/ Tympanum hidden; covered by skin; body scales are strongly heterogeneous, many of the larger scales on the body and head keeled or moderately spinose; a series of enlarged, spinose scales on either side of the base of the tail (subgenus *Chapmanagama* Hoser, 2015), or:

3/ Tympanum hidden; covered by skin; body scales are strongly heterogeneous, many of the larger scales on the body and head keeled or moderately spinose; no series of enlarged, spinose scales on either side of the base of the tail (subgenus *Turnbullagama* Hoser, 2015).

Notactenophorus Hoser, 2015 is readily separated from all other members of the genus *Ctenophorus* (where it has been placed until now, as defined in Cogger 2014) and *Pseudoctenophorus* Hoser, 2015 by the following unique suite of characters: Tympanum is hidden being covered by skin, the body scales are smooth, mostly small, homogenous, with scattered larger but small, flat scales, not keeled or spinose, with a dorsal pattern of a longitudinal dorso-lateral series of five or six large black spots on either side.

Distribution: *C. shireenhoserae sp. nov.* is known only from near the type locality and nearby areas in Western Australia, generally between Paynes Find and Mount Magnet in Western Australia.

C. sharonhoserae sp. nov. is found in the semi-arid zone of south-western Western Australia, away from the Darling Range and south coast of Western Australia, and also south of the mulga-eucalypt line in south-west Australia. The distribution is mainly in the Goldfields region of southern Western Australia, Australia.

C ornatus is restricted to the Darling Range (near Perth) and wetter parts of the south coast of south-western Australia.

Etymology: *C. shireenhoserae sp. nov.* is named in honour of my wife Shireen Vanessa Hoser from a remote part of Africa called “Athlone”, in recognition of her contributions to herpetology over more than 20 years.

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CONFLICTS OF INTEREST

None.