Eramurra Solar Salt Project
Minuria tridens resolution study

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Summary

This document contains two reports undertaken in the process of resolving the identity of Western Australian *Minuria* populations that are currently recorded as *Minuria tridens*. The first report (pages 2-6) details a morphological assessment of the Western Australian populations as compared to those in the Northern Territory, where the species was first described and are considered 'true' *M. tridens*. This assessment found several morphological characters that differed between the Western Australian and Northern Territory populations, as well as between the two Western Australian populations, that are typically considered diagnostic for species of this genus. The second report (pages 7-15) details a molecular assessment of the *Minuria* genus, with a focus on the relationship between the Western Australian and Northern Territory populations. The molecular results were consistent with the morphological assessment, finding that the two Western Australian populations and the Northern Territory population each form their own distinctive phylogenetic clades, consistent with species-level divergence across the genus. From these assessments, we conclude that the two Western Australian populations are not *M. tridens* and instead, represent two novel species. To resolve the clear misapplication of the name *M. tridens* in Western Australia, the two new species need to be taxonomically recognised. In the short term, this will be resolved by raising two phrase-names to allow all *M. tridens* specimens in Western Australia to be re-assigned appropriately until such a time that these two new species can be formally named and described.

REPORT I: A comparison of the morphology of *Minuria tridens* (D.A. Cooke) Lander between populations in Western Australia and the Northern Territory

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1. Background and Methods

Minuria tridens (D.A. Cooke) Lander was originally described as *Olearia tridens* D.A. Cooke (Cooke 1986) with the Holotype from Trephina Gorge in the Northern Territory (NT) and the typical habitat described as steep rocky slopes and cliffs. *Olearia tridens* was transferred to *Minuria* in 1987 (Lander 1987) and for the purposes of this report will be referred to by that name. The most obvious feature that separates *M. tridens* from other *Minuria* species is that the majority of the leaves have three distinct teeth at the apex. In 1986 a specimen of *Minuria* with leaves having three teeth at the apex was collected in Western Australia (WA) from Lake Austin and was identified as *Minuria tridens*. No other *Minuria* with similar leaves was collected in Western Australia until March 2020, when collections were made from locations at and near the coast between Onslow and Karratha, *ca*. 745 km NW of Lake Austin. One of these specimens had some leaves with distinct teeth which, following the 1987 modified key by Lander, keyed out to *M. tridens*. Further *Minuria* collections from the Onslow–Karratha area were made in 2021 and these were also identified as *M. tridens* based on the similarity to the 2020 collections.

In March 2020, a request to review the identification of the Lake Austin *M. tridens* specimen was received as this specimen was affecting decisions regarding the conservation of *M. tridens* in the Northern Territory. An initial assessment was made by Dave Albrecht, then based in Canberra, using duplicate material and these findings were used as a basis for assessing the material held at Perth. As there was no material of *M. tridens* from the NT held at Perth, no direct comparison between the Lake Austin and NT *M. tridens* could be made but, after comparing the Lake Austin *M. tridens* with the description provided in the original description by Cooke and with the notes made by Dave Albrecht, it seemed highly unlikely that the *Minuria* from Lake Austin was *M. tridens s. str*. While this assessment was being made, the specimens of *M. tridens* from the Onslow–Karratha area were lodged at the WA Herbarium. The majority of specimens only had entire leaves while one specimen had a number of leaves with distinct teeth and one other specimen had only a single leaf with a tooth. The variation in the degree of lobing on the leaves of these specimens suggested that this was not a consistent character and that it was possible that the WA specimens of *M. tridens* may be another described species. An initial check of the WA *Minuria* specimens held at Perth revealed that a number of specimens did not align with the descriptions published in the most recent review of the genus by Lander and Barry (Lander & Barry 1980). A more in-depth examination of the WA *Minuria* specimens was started and four specimens of *M. tridens* (*sensu stricto*) were taken on loan from the NT. Measurements and character states for

key taxonomic characters were recorded for all the WA and loaned NT *M. tridens* specimens along with a subset of characters for all the WA *Minuria* spp. collections. Several achene and pappus measurements were not compared as they vary with maturity and on the Lake Austin specimen these were not fully mature. Few ray floret ligules were measured as they often curl on drying and rehydrating them can be destructive.

2. Results

The three disjunct populations currently identified as *M. tridens* (Figure 1) share a number of characters including being small, woody shrubs; leaves that have toothed apices (although this is variable in the WA populations); ray floret achenes longer than disc floret achenes; and having a dimorphic disc floret achene pappus. However, a number of significant differences were observed between the *M. tridens* specimens from Onslow–Karratha, Lake Austin and the NT (Table 1). Some character measurements suggest further differences but due to the relatively small number of specimens, especially the Lake Austin entity which is a single collection, and the variation in maturity of the flower and fruits, it was decided to omit them from the table until additional material can be examined.

Minuria tridens s. str. differs from the WA specimens in having an indumentum of crisped hairs with persistent conical bases on the stems, peduncles and leaves (*cf.* clumps of crisped hairs in the leaf axils and with sparse crisped hairs on the peduncles and young leaves, otherwise glabrous); the leaf apex being symmetrically divided into ± equal teeth 0.5–2.6 mm long, sometimes with 1–4 additional smaller teeth, rarely entire (*cf.* usually entire or with up to 5 teeth 0.3–1 mm long (Onslow–Karratha); entire or with 2–4 teeth 0.5–1 mm long (Lake Austin); the involucral bracts having a sparse to moderate indumentum of glandular hairs with sparse eglandular hairs on the midrib (*cf.* glabrous); ray floret achenes with a moderate to dense indumentum of biramous hairs that are barbed (distinctly recurved at the apex = glochidal) (*cf.* sparse to moderately dense hairs that are minutely notched at the apex (Lake Austin) or sparse hairs that are distinctly divided to glochidal (Onslow–Karratha)); disc floret flora tubes that have sparse eglandular hairs on the abaxial surface near the apex (*cf.* glabrous); disc floret achenes with sparse glochidal hairs (*cf.* glabrous); and frows on steep rocky slopes and cliffs in skeletal soils (*cf.* low coastal dunes (Onslow–Karratha) or edge of a saline lake (Lake Austin)).

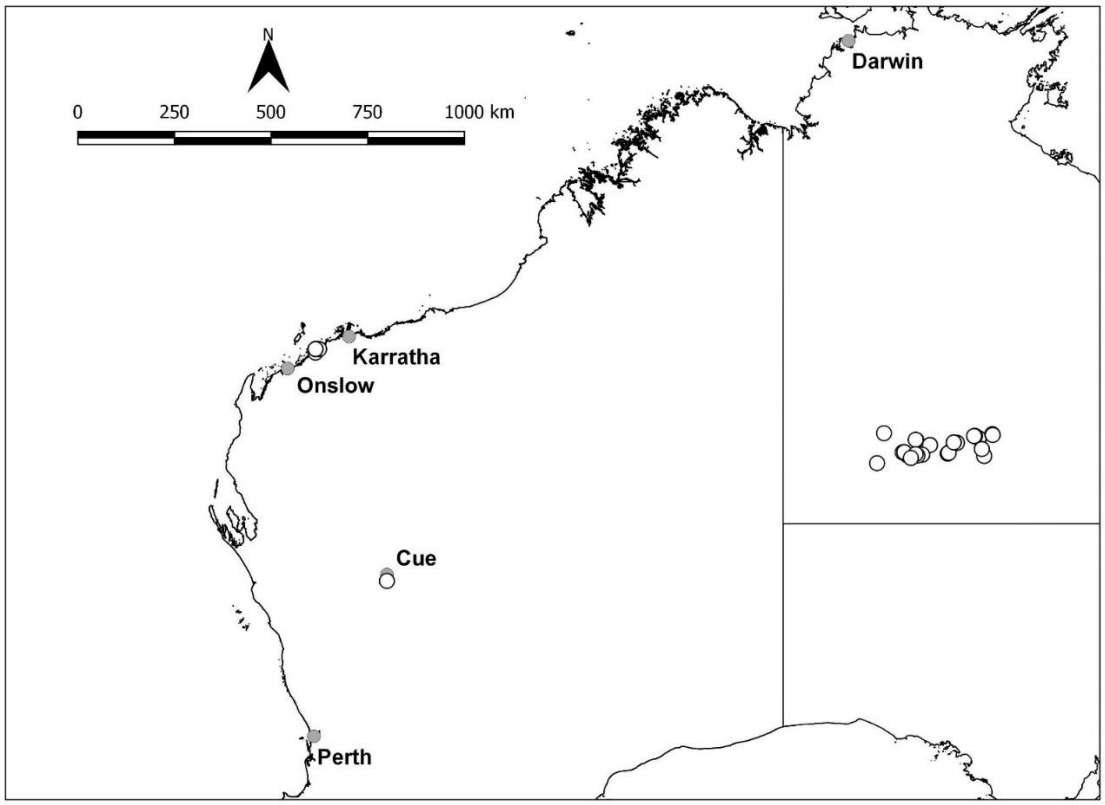

Figure 1. Distribution of *Minuria tridens s. lat.* (○) in Australia.

The *M. tridens* specimens from Lake Austin differ from the Onslow–Karratha specimens in the leaf apex being entire or divided into 2–4 teeth 0.5–1 mm long (*cf.* usually entire or with up to 5 teeth 0.3–1 mm long); peduncles 18–27 mm long (*cf.* 8–10 mm long); capitula discoid 10–13.5 mm diam. (cf. conical to broadly conical 4.5–9 mm diam.); ray floret achene with sparse to moderately dense hairs that are minutely notched at the apex (*cf.* sparse hairs that are distinctly divided to glochidal); and disc floret achenes slightly obconical (*cf.* cylindrical).

Examination of the WA collection of *Minuria* revealed a number of specimens that did not match the description of the taxon they had been identified as. Of particular interest, as they have a number of characters similar to the two WA entities under *M. tridens*, are specimens that have been variously identified as *M. cunninghamii* (DC.) Benth. and *M. leptophylla* DC. but do not match either of these for a number of characters usually regarded as significant for this genus. Several of these specimens have rare leaves with additional teeth near the apex. These specimens may represent one or more undescribed species of *Minuri*a and may be the same as or closely related to the entities in WA currently regarded as *M. tridens*. It is anticipated that the pending molecular studies will be valuable in guiding the direction of future advances in the taxonomy of this genus.

Table 1. Character differences between the three populations of *Minuria tridens* in the Northern Territory (NT) and Western Australia (WA).

	Minuria tridens (NT)	*Minuria tridens* (WA, Onslow–Karratha)	*Minuria tridens* (WA, Lake Austin)
Stem indumentum	minutely arachnose, crisped hairs to 0.4 mm long with persistent, compressed conical bases to 0.15 mm high; later scabridulous with conical hair bases which no longer possess the arachnoid hairs	clump of crisped hairs 0.25–0.35 mm long in the leaf axils, otherwise glabrous	clump of crisped hairs to 0.3 mm long in the leaf axils, becoming inconspicuous with age; otherwise glabrous
Leaf indumentum	as per stems	young leaves with sparse crisped hairs (and sometimes glandular hairs) on margins, quickly becoming glabrous with age	young leaves with sparse crisped hairs, quickly becoming glabrous with age
Leaf apex	usually symmetrically divided into 3 ± equal, acute, mucronulate, slightly recurved teeth 0.5–2.6 mm long, sometimes with 1–4 additional shorter teeth, rarely entire	acute, mucronate, sometimes slightly recurved, usually entire but one individual observed with some leaves with up to 5 teeth 0.3–1 mm long	acute, mucronate, entire or with 2–4 teeth 0.5–1 mm long
Floral leaves	0–8, narrow-lanceolate scales 1.4–3.5 × 0.3–0.5 mm, sparse to moderate indumentum of short glandular hairs (especially on upper leaves) along with compressed conic hair bases	1–4, narrow lanceolate, margins with crisped and glandular hairs, 1–2.3 × 0.4 mm	1–4, narrow triangular-lanceolate, margins with crisped hairs, 1.4–3 × 0.3–0.5 mm
Involucral bract indumentum	sparse to moderate short, glandular hairs, sometime with additional sparse long simple hairs on mid rib	glabrous	glabrous
Ray floret achene indumentum	moderate to dense, appressed to ascending, glochidal hairs	sparse, appressed hairs, apex distinctly divided to glochidal	sparse to moderately dense, appressed to spreading hairs, apex minutely notched
Disc floret floral tube indumentum	sparse, simple hairs on abaxial surface of corolla near apex	glabrous	glabrous
Disc floret achene indumentum	sparse, appressed to ascending glochidal hairs	glabrous	glabrous
Habitat	steep rocky slopes and cliffs in skeletal soil	low coastal dune system adjacent to tidal, saline mudflats in orange-red sand	roadside, Lake Austin

3. Summary

The three disjunct populations of *M. tridens s. lat*. differ from each other in a number of characters that are usually considered diagnostic for the genus. The two WA populations are not *M. tridens s. str*. and are either variants of other named taxa or are undescribed entities. A molecular study is currently underway that will provide a valuable framework for circumscribing the two WA *M. tridens* entities.

4. References

Cooke, D.A. (1986). Two new species of *Olearia* Moench (Compositae: Astereae) from central Australia. *Muelleria* 6(3): 181–184.

Lander, N.S. & Barry, R. (1980). A review of the genus *Minuria* DC. (Asteraceae, Astereae). *Nuytsia* 3: 221–227.

Lander, N.S. (1987). New combinations in *Minuria* DC. (Asteraceae, Astereae). *Nuytsia* 6(1): 63–66.

REPORT II: A comparison of the genetics of *Minuria tridens* (D.A. Cooke) Lander between populations in Western Australia and the Northern Territory

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Project summary

This document reports on a molecular investigation into the identity of populations of the daisy *Minuria* DC. from near Onslow, Western Australia (WA). These populations were originally identified as *Minuria tridens* (D.A.Cooke) Lander but more recent morphological assessments indicated that they differed from the morphology of *M. tridens* in the Northern Territory (NT), where the species was first described. To assess the taxonomic placement of this Onslow population in *Minuria*, genetic sampling was undertaken across the genus using herbarium specimens from across Australia. The resulting phylogenetic analyses indicated that:

- Specimens of *Minuria* from near Onslow do not group with specimens of *M. tridens* from the Northern Territory (**are genetically distinct**);
- Specimens of *Minuria* from near Onslow instead group with specimens from Western Australian deserts, including *M. macrocephala* Lander & R.Barry and the phrase name taxon *M.* sp. Little Sandy Desert (S. van Leeuwen 4919);
- Other close relatives of this group include the widespread *M. cunninghamii* (DC.) Benth., *M. rigida* J.M.Black from eastern Australia, and another taxon near Lake Austin, south of Cue, that includes another WA specimen previously identified as *M. tridens*.

The genetic data are consistent with populations of *Minuria* from near Onslow belonging to a species that is distinct from *M. tridens* and potentially in need of formal description. Specimens from the other locality for *M. tridens* in WA (near Cue) likely represent an additional distinct species, also in need of description. *Minuria tridens* appears to be restricted to the Northern Territory.

1. Background

Small, typically white-flowered daisies in the genus *Minuria* DC. (Asteraceae) are found across much of Australia, usually in drier regions and sometimes associated with salt lakes. The genus currently includes twelve species of small shrubs or herbs (Lander & Barry 1980; Lander 1987; Short 1991; Short & Hosking 2000), of which eight are thought to occur in Western Australia (WA) (Western Australian Herbarium 2024). In addition, one phrase name taxon is recognised in WA: *M.* sp. Little Sandy Desert (S. van Leeuwen 4919) (Western Australian Herbarium 2024), but no details of how it differs from other species have been recorded. Relationships among and delimitation of genera in the tribe to which *Minuria* belongs (Astereae) are known to be

problematic, and previous studies have found four other genera to be nested within *Minuria*: *Chondropyxis* D.A.Cooke (one species), *Elachanthus* F.Muell. (two species), *Isoetopsis* Turcz. (one species) and *Kippistia* F.Muell. (one species, once *Minuria*) (Schmidt-Lebuhnn *et al*. 2015; Chen *et al*. 2024).

Recent survey work (2020–2021) near Onslow along the northwest coast of WA led to the collection of several *Minuria* specimens that were identified as *M. tridens* (D.A.Cooke) Lander, a species that typically occurs in the Northern Territory (NT) and had only been otherwise recorded in WA from near Cue, more than 700 km to the south of Onslow. This species is listed as Vulnerable under the Federal EPBC Act 1999 and is assigned as conservation Priority 1 in WA (Western Australian Herbarium 2024). At the time of sampling, morphological assessment of the Cue specimen by Dave Albrecht (see accompanying morphological report by S.J. Dillon) had suggested that it was unlikely to be *M. tridens*. More recent morphological assessment by S.J. Dillon confirmed this suggestion and indicated that the entities near Onslow and near Cue were different from each other and that both were different from *M. tridens* in the Northern Territory, where the species had been described from (Cooke 1986).

Following uncertainty about the identity of the Onslow and Cue *Minuria* specimens, the Department of Biodiversity, Conservation and Attractions (DBCA) was subcontracted by S. van Leeuwen at Curtin University, on behalf of Leichhardt Salt Pty Ltd., to undertake morphological and molecular assessments to clarify the status of *M. tridens* in WA. The morphological work was undertaken by S.J. Dillon and has already been reported on. This report details the results of the molecular investigation.

2. Methods

Because of the known issues with generic delimitation in Astereae and indications of unrecognised taxa in WA, a broad sampling strategy was required. The presence of eight of the twelve *Minuria* species in WA, and the widespread nature of some of those species, meant that it was possible that relatives of the Onslow and/or Cue populations could be represented elsewhere in Australia. Since no substantial phylogenetic work has been published on the genus (only single samples from a few species), it was necessary to understand the relationships among *Minuria* species and the related genera that had been found to be nested in *Minuria*, so that the WA specimens, if not *M. tridens*, could be clearly placed and closest relatives determined.

We made use of herbarium specimens to cover the broad distribution and taxonomic diversity of *Minuria* and its relatives. Leaf samples were principally collected from specimens at the Western Australian Herbarium (PERTH, 49 samples), the State Herbarium of South Australia (AD, 44 samples) and the Northern Territory Herbarium (DNA, 25 samples). A few samples were also sent to us from the National Herbarium of New South Wales (NSW, 10 samples). These samples were obtained in late February 2024 and consisted of representatives of all known species in *Minuria,* some species in allied genera, as well as some unclear taxa in WA and most known specimens of *M. tridens*.

The genetic approach was chosen to provide a large set of nuclear markers obtainable from dried herbarium material. For this purpose, we selected target capture sequencing with the Angiosperms353 bait set (Johnson *et al*. 2019). Effectively, the approach fishes out DNA sequences matching a set of baits for each sample, reducing the portion of the genome that needs to be sequenced and allowing us to compare DNA sequences among samples for the same set of over 300 genes. It is substantially more powerful for phylogenetic analysis than previous approaches that relied on a few markers.

In April 2024, leaf samples were shipped to the Australian Genome Research Facility (AGRF) in Adelaide for DNA extraction, followed by library preparation, target capture and massively parallel sequencing. Sequencing data was returned for assembly and analysis in early June 2024. Additional data were obtained from publicly available sources (e.g. Kew's Plant and Fungal Trees of Life, https://www.kew.org/science/our-science/projects/plant-and-fungal-trees-of-life; or the Genomics for Australian Plants initiative https://www.genomicsforaustralianplants.com/) to allow the inclusion of additional samples for key species.

Data were quality filtered and then assembled with HybPiper v. 2.1.7 (Johnson *et al*. 2016) on the Setonix supercomputer, of which access is provided by the Pawsey Supercomputing Centre and supported by funds from the Australian Government and the Government of Western Australia. During preliminary analyses, there were some indications that paralogs might be present and of potential conflicting phylogenetic signal, so another assembly approach was used to complement and compare with HybPiper: a modification of the SECAPR pipeline (Andermann *et al*. 2018). In short, both methods attempt to reconstruct the target sequences but differ in the order of steps: HybPiper maps reads first, then assembles; SECAPR assembles, then checks assembled pieces for similarities to targets. At the end of multiple assemblies, both approaches recovered similar results.

Phylogenetic analyses included a maximum likelihood (ML) concatenation approach (i.e. concatenating all the sequences together and comparing them in one large analysis) and a summary coalescent approach (i.e. analysing each of the 300+ target loci separately, then comparing all the output trees to make a single overall tree). The ML approach and the individual trees were run in IQ-TREE v. 2.1.2 (Minh *et al*. 2020), and the summary tree in ASTRAL v. 5.7.1 (Zhang *et al*. 2018). Both approaches may provide insight into phylogenetic relationships, but the ASTRAL approach is thought to better handle the mixed signals that can be expected from the different markers. The concatenation approach gives a better overall indication of how different samples are. In the preliminary analyses, both approaches generally supported the same main groupings.

3. Results

The resulting ASTRAL tree based on the modified SECAPR approach for the ingroup (Astereae) is shown in Figure 1, along with annotations of putative taxa and their geographical distributions in Australia. Overall, the tree showed strong phylogenetic structure among *Minuria* species and related genera, clearly delimiting multiple highly distinct species that had previously been

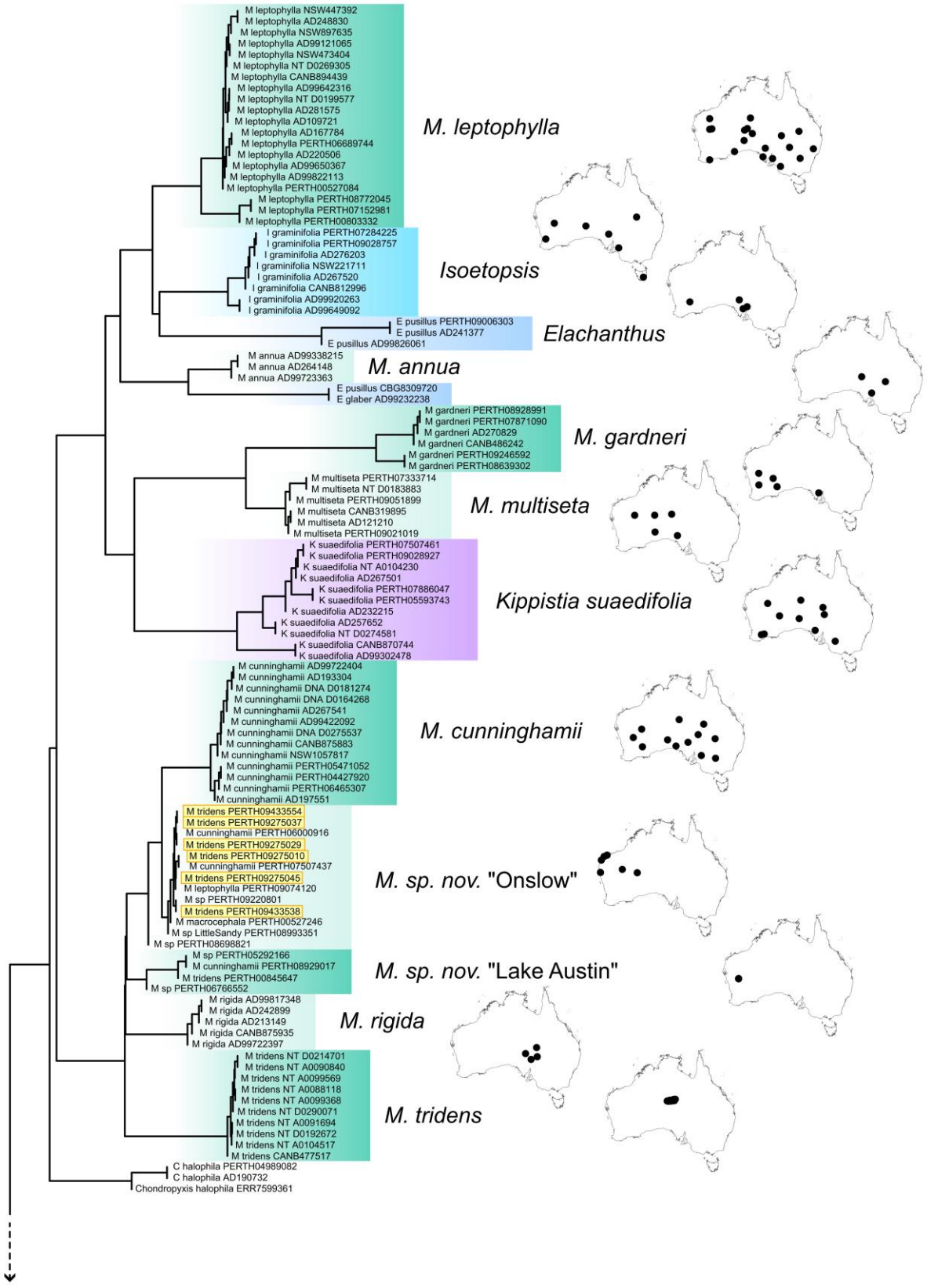
recognised morphologically. In most species there were no indications of intermediates or close connections with sister species, and even species with Australia-wide distributions showed remarkable genetic cohesion in most cases (e.g. *M. leptophylla* and *M. cunninghamii*). Within other species there were indications of more structure and potentially multiple entities (e.g. *M. integerrima* Benth. and *M. denticulata* (DC.) Benth.). To understand the overall placement of *M. tridens* and the Onslow/Cue specimens, it is important to first document the broader relationships seen in the phylogenetic analysis.

3.1 *Minuria*

As currently recognised, *Minuria* comprises species that are not monophyletic (forming a single clade) and excludes others that should be part of it. As previously found by other studies, the samples representing *Elachanthus*, *Isoetopsis* and *Kippistia* were nested within *Minuria* and were closely related to *M. annua* (Tate) J.M.Black, *M. leptophylla*, *M. gardneri* Lander & R.Barry and *M. multiseta* P.S.Short. These genera will likely need to be re-classified as *Minuria*. The other main clade in *Minuria* proper contained *M. cunninghamii* and its relatives, including our focal taxon *M. tridens*. Falling outside of *Minuria* proper, there were a number of morphologically diverse taxa that were suspected to be outside the genus before sequencing: *M. macrorhiza* (DC.) Lander in northern Australia, *M. scoparia* P.S.Short & J.R.Hosking from isolated serpentine outcrops in New South Wales, *M. denticulata* (with two clades that are morphologically diverse) and *M. integerrima* (widespread with strong indications of structure). These taxa will also likely need to be re-classified and will no longer be *Minuria*. Of these, *M. integerrima* is a special mention as it occurs near the Pilbara coast and Shark Bay and may come up in future flora surveys; it is not a close relative of *M. tridens*. How these non-conforming taxa should be treated taxonomically is outside the scope of this report but it is worth noting that these results will have important implications for our understanding of *Minuria* more broadly in Australia.

3.2 The *Minuria cunninghamii* clade

The broader *M. cunninghamii* clade comprised at least five taxa/clades, of which three have well recognised names: *M. cunninghamii* (widespread across Australia), *M. rigida* J.M.Black (morphologically distinctive leaves and from NE South Australia), and *M. tridens* (Northern Territory ranges). The WA Onslow/Cue specimens fell within the two remaining clades, indicating two additional taxa: (1) a novel taxon comprising specimens from Lake Austin near Cue (labelled on Fig 1 as *M. sp. nov.* "Lake Austin") which includes the single specimen of *M. tridens* from near Cue, and (2) a novel taxon comprising specimens identified as a form similar to the specimens near Onslow (labelled on Fig 1 as *M. sp. nov.* "Onslow") and specimens that had been misidentified as other species (*M. cunninghamii* and *M. leptophylla*). The Onslow group also included a couple of surprising specimens that are allied to *M. cunninghamii*: *M. macrocephala* Lander & R.Barry and *M.* sp. Little Sandy Desert (S. van Leeuwen 4919), as well as an unknown specimen from even further east of the Little Sandy Desert.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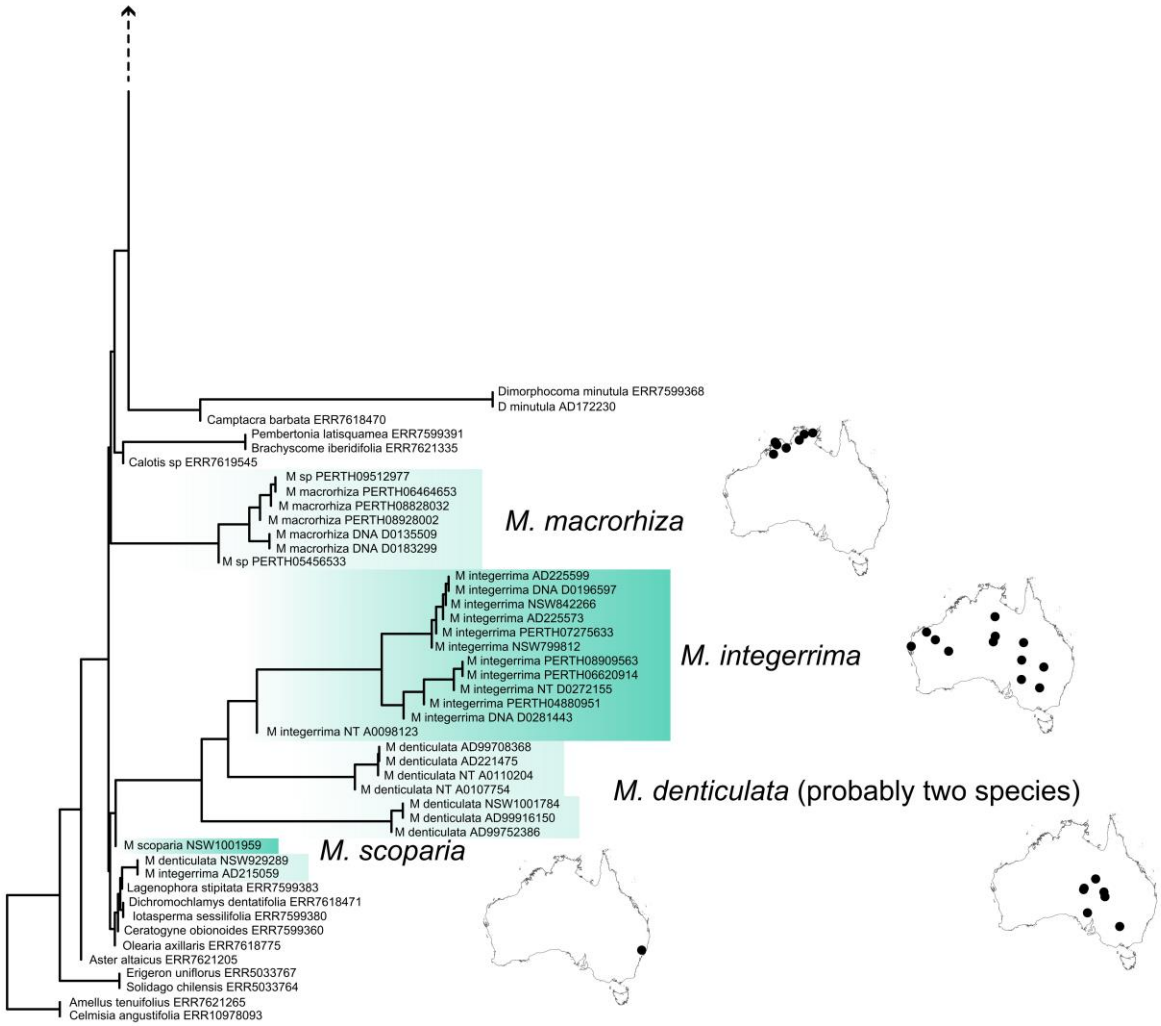

Figure 1 (including previous page). ASTRAL phylogenetic tree of *Minuria* and related genera based on 327 target loci. Support values omitted for clarity. Branch lengths roughly represent estimated divergence time relative to sample size. Distribution maps show localities of herbarium specimens used in the analysis. *Minuria* species/taxa are labelled and highlighted in green, while some associated genera thought to be part of *Minuria* are highlighted in blue and purple. Specimens identified as *M. tridens* from near Onslow are highlighted individually in yellow. Most labels include a herbarium barcode or an online source for the sequence. Nine CANB/CBG specimens are from Chen *et al*. (2024).

Our results clearly supported the distinction of the morphologically clear *M. cunninghamii*, *M. rigida* and *M. tridens*, as well as the morphologically ambiguous taxon near Lake Austin, but there were some indications of mixed signals in the Onslow group. This mixed signal is partly apparent in Figure 1 with the odd branching order of one sample in that group (the geographically divergent eastern sample PERTH 08698821), and a recovered grade in the HybPiper concatenation results (not shown), all of which point to shared signal intermediate between *M. cunninghamii* and *M.*

tridens that is poorly displayed in a tree. The cause of that signal is unclear but might indicate potential historical hybridisation between ancestors of *M. cunninghamii* and *M. tridens* that has been retained in the Onslow group. Regardless, overall divergences suggest that the Onslow group shares some common ancestry and shared evolutionary history among its members, consistent with it being recognised as a distinct species.

While not clear in Figure 1, the ML concatenation results from the SECAPR analysis and earlier HybPiper runs using only coding regions indicated some support for a sister relationship between the Lake Austin taxon and Northern Territory *M. tridens*, consistent with its closer morphological similarity to that taxon (though still discrete differences; see the morphological report by S.J. Dillon). While arguments for treating it as a divergent population of *M. tridens* could be made, our results point to substantial divergence between the two clades and treating it consistently with other distinct taxa in the larger clade, such as *M. cunninghamii* and *M. rigida*, in conjunction with the morphological differences already documented, we interpret these clades as distinct species.

3.3 *Minuria tridens*

All samples of *M. tridens* from the Northern Territory (including one from Chen *et al*. 2024) formed a very cohesive group with limited indications of diversity or connectivity to any other taxa. As mentioned above, there was a great deal of divergence between the *M. tridens* clade and others in the broader *M. cunninghamii* clade (that included the Onslow and Lake Austin specimens), though there are some suggestions of a sister relationship with the Lake Austin taxon. While there were some indications of a mixed signal within the Onslow group, those samples appeared to represent a taxon with shared history, albeit spread across some of the less well-collected areas in WA. They do not show any modern connection to *M. tridens* or fall in that clade, nor does the specimen near Cue/Lake Austin. This outcome is consistent with our morphological assessment for these entities and thus, it appears that the specimens of *M. tridens* in WA have been misidentified; although given their close relationships and morphological similarities relative to *Minuria* species more broadly, these misidentifications are understandable.

4. Summary and Recommendations

Based on our results, *M. tridens* does not occur in Western Australia; the specimens currently identified under this name at Onslow and Lake Austin need to be re-determined. To effectively do that, additional taxonomic work is needed to name and describe these two new species that we have informally labelled as *M. sp. nov.* "Onslow" and *M. sp. nov.* "Lake Austin". That taxonomic work may be part of a broader revision to cover the full range of taxonomic outcomes found in this report for Australian *Minuria* or could be a focused effort at PERTH to cover just these two novel species. In the interim, phrase-names will be raised for the *M.* sp. nov. "Onslow" and "Lake Austin" species, and all existing specimens will be re-assigned to these names, such that there will be no specimens of *M. tridens* recorded from Western Australia and this species will be appropriately removed from the Western Australian plant census. New conservation

assessments will be undertaken for these new species, which will require additional collecting and survey effort to document their respective geographic extents and confirm threat status. Of particular interest, increased collections in the Little Sandy Desert region would help to elucidate whether the Onslow taxon is a poorly known but widespread species across this region or if there are additional unknown taxa that were not included in our sampling. Given that such survey may be delayed by resource and logistical constraints in this remote region, the new phrase-named species are likely to be assigned as Priority conservation taxa in Western Australia until more data are obtained to enable formal conservation assessment.

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