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Synonymisation of *Erigeron conyzoides* under *E. acris* (Asteraceae: Astereae), with a key to Australian *Erigeron*

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Introduction

Erigeron conyzoides F.Muell. is the only species of its genus currently considered native to Australia, after other species previously placed in *Erigeron* L. were segregated as *Pappochroma* Raf. (Nesom, 1998). It occupies a restricted range in the higher elevation parts of New South Wales and Victoria. However, it is phylogenetically isolated from all other native members of Asteraceae tribe Astereae and geographically isolated from its closest relatives, which occur in the northern hemisphere (Chen et al., 2024).

Erigeron conyzoides is also very rare to the extent that it remained, until recently, understudied. The species has not been collected in New South Wales since 1978 and is listed as Endangered under the Victorian Government's *Flora and Fauna Guarantee (FFG) Act 1988*'s Threatened List as of February 2024 (DEECA, 2024).

Recently, fieldwork and molecular phylogenetic analyses were conducted to support biological control research on *Erigeron bonariensis* L., of which *E. conyzoides* is the closest presumed native relative and thus a potential concern for off-target damage caused by biological control agents. Results indicated that, on the balance of evidence, *E. conyzoides* is unresolved as a native Australian species and synonymous with the

Abstract

Erigeron conyzoides F.Muell. is considered the only native Australian species of its genus but is geographically isolated from its close relatives in the northern hemisphere and phylogenetically isolated from its closest relatives in Australia. The very rare and apparently declining species was recently located during field work. Field observations, morphological study, phylogenomic analysis, and the correlation of its decline with the removal of grazing from alpine areas suggest that it is not likely to be a native species but a recent, disturbance-dependent introduction from the northern hemisphere. Here, *Erigeron conyzoides* is lectotypified and formally synonymised with *Erigeron acris* L. We also provide a description of the recently established *E. bellioides* DC. and a key to all species of *Erigeron* currently known to be introduced to Australia.

Keywords: Bitter fleabane, Compositae, nomenclature, taxonomy

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subarctic northern hemisphere taxon *E. acris* L. (Chen et al., 2025) and thus introduced.

Although it is difficult to confidently assign *Erigeron conyzoides* specifically to one of the subspecies of the diverse *E. acris* complex as recognised in recent regional taxonomic treatments (Olander & Tyler, 2017; Sennikov & Khozin, 2023), it shows mosaic-like morphological affinities with some subarctic to alpine subspecies including *E. acris* subsp. *politus* (Fr.) H.Lindb. (colouration of stems and phyllaries) and *E. acris* subsp. *droebachiensis* (O.F.Müll.) Arcang (capitulescence structure and number of cauline leaves). The exact provenance of the Australian plants in the northern hemisphere must therefore await a comprehensive taxonomic revision of the complex across its range, but their restriction to disturbed or anthropogenic habitats and decline in parallel with the removal of grazing from the Australian Alps suggest that it was almost certainly accidentally introduced to the Australian Alps by early European graziers (Chen et al., 2025). Its status in Australia should at best be treated as uncertain.

Here, *Erigeron conyzoides* is formally synonymised, the existing potential type material is discussed, and the name lectotypified.

During a visit to Cairns in 2023, the first author encountered *Erigeron bellioides* DC., a species originally from the Caribbean. Although recognised as introduced to Australia by the Census of the Queensland Flora (Brown, 2021), it is not yet part of the Australian Plant Census (accessed 19.ii.2025) and not covered by any identification keys in Australia. We therefore also provide a full description of *E. bellioides* and a key to all species of *Erigeron* currently known to be introduced to Australia.

Type material of Erigeron conyzoides

Confusion surrounding the type material and the type locality of *Erigeron conyzoides* has been caused by inconsistent collector notes. In the protologue, the type locality is given as "on the sources of the Murray and Snowy Rivers". Six herbarium sheets (or their images) were found that potentially represent type material, but none of them have label data matching the descriptive statement.

NSW 607559 bears a Mueller label with the writing "Tributaries of the Clarence River". Nicholas S. Lander added a note in 1974 (incorrectly cited as "1947" on the label) reading, "the locality on this specimen (in Betche's handwriting) is in error! This species is known only from the Southern Tablelands. It is quite possibly a part of the type collection." The sheet bears only two partial inflorescences and fragments; larger leaves and the main stems are absent.

K000885080 is likewise labelled as "Tributaries of the Clarence River". It bears another label reading "iii. p. 495", referring to the volume and page where the species was treated in Bentham's *Flora Australiensis* (Bentham, 1866). The sheet bears a single but large and richly branched plant with many capitula.

K000885081 is labelled "Berrima". It also bears a label referring to the *Flora Australiensis* but seemingly reading [volume] "iii. p. 494". A pencilled addition refers to the publication of an isonym (Mueller, 1856). The sheet bears two large plants, one of them with a few roots, with multiple capitula.

MEL 603814 is labelled "Berrima" and "ad torrentis alpium Australia" [at the streams of the Australian alps]. The sheet bears several discoloured stems, one of them with an unusually large leaf, but only few capitula.

MEL 2158934 is labelled "ad fluminis Snowy river ripas, hieme inundatus (ostium versus) Radius albus. Martio 54" [on the banks of the Snowy river, flooded in winter (towards the mouth), ray white. March 54]. A label was added by Jim H. Willis in 1950 reading, "F.v.Mueller does not mention 'towards the mouth of the Snowy' in his TYPE description. Did [sic] this information (unusual for an alpine plant) refer to the accompanying specimen or to some other plant, since misplaced?" Another label points at one of the stems on the sheet and reads, "a flowering branch was removed from this point (q.v.) and mounted separately as '*Erigeron Bonariensis* from the Australian Alps' (see specimen)". This sheet is MEL 2158932A, which has a label reading, "'Broken from the specimen which Mueller labelled 'Ad fluminis Snowy River ----- (ostium versus)' March 1854' (q.v.)", and which has since been re-determined to *Erigeron conyzoides*. The sheet MEL 2158934 itself bears one partial inflorescence with few capitula, a stem base with a few leaves, and some fragments.

Mueller's locality description as "on the sources of the Murray and Snowy Rivers" implies at least two gatherings from two different locations. It is likely that the "Berrima"

mentioned on MEL 603814 and K000885081 refers to the Berrima Range and/or Berrima Creek, which are located at ca. 36.7816582 S 148.2307417 E, south of Thredbo at the border between New South Wales and Victoria and very close to the source of the Murray River (https://etaunknown.com/expeditions/murray-river/source, accessed 12 Apr 2024). Mueller visited this area in early 1854 (Eugenia Pacitti, pers. comm.). These sheets are therefore likely to be the material Mueller referred to when mentioning the Murray River in the description.

Since it was collected at the Snowy River, MEL 2158934 and its fragment MEL 2158932A are likely to be the material Mueller referred to when mentioning that river. Understandably, confusion has been caused by the mention of "ostium" [river mouth] on the specimen label of MEL 2158934. It seems likely that this word was written in error but then corrected to "sources" at publication. As noted by others on labels added later, the entity currently accepted as *Erigeron conyzoides* in Australia is an alpine species. It does not seem plausible that it would have been collected at the mouth of the Snowy River at the east Gippsland coast and then published in a paper with a title reading "Descriptive characters of new alpine plants". The reference to "Clarence River", which is in northeastern New South Wales, on two other sheets is equally implausible for the same reason, but as there is no reference to that river in the description of the species, they are at any rate less attractive candidates for lectotypification.

Under the assumption that the description of *Erigeron conyzoides* by Mueller refers to original material from two different gatherings, one at the source of the Murray River (Berrima), the other at the source of the Snowy River, MEL 2158934 from the Snowy River is here selected as lectotype because of the quality of the material, its placement at Mueller's home institution, and the unusually detailed label information that includes a month of collection and even the colour of the ray florets (Fig. 1).

Taxonomy

***Erigeron acris* L., *Sp. Pl.* 2: 863 (1753).**

Type: **SWEDEN.** Herb. Linnaeus 994.16 (lectotype: LINN, designated by Huber, *Berichte des Geobotanischen Instituts der Eidg. Techn. Hochschule* 114: 44. 1993).

= *Erigeron conyzoides* F.Muell., Descriptive characters of new alpine plants, from continental Australia. *Transactions of the Philosophical Society of Victoria* 1: 105 (1855).

Type citation: On the sources of the Murray and Snowy Rivers, (4000 to 5000 feet).

Lectotype *(designated here)****:*** Ad fluminis Snowy river ripas, *F. Mueller s.n.*, iii.1854 (MEL 2158934, isolectotype: MEL 2158932A).

= *Erigeron conyzoides* F.Muell., isonym, *Hooker's J. Bot.* 8: 146 (1856).

= *Erigeron conyzoides* F.Muell., nom. inval., nom. nud., Second gen. rep. Gov. Bot. veg. Colony. Victoria – Parl. Pap. Votes and Proc. Legislative Assembly: 12 (1854).

Perennial herb to ca. 50(–80) cm tall. Stems one to several per plant, erect, striate, usually deeply dark purple, glabrous or sparsely to moderately septate-hairy towards the top, branched into capitulescence in upper third to half. Leaves oblanceolate, to 120 mm long and 15 mm wide, decreasing in size towards stem apex; margins sharply but sparsely serrate to entire; subglabrous with sparse septate hairs especially on margins or moderately septate-hairy especially adaxially and on margins. Capitulescence terminal, narrowly paniculate to seemingly racemose in stems with few capitula, with ca. 8–30 capitula. Involucre of ca. three rows; phyllaries lanceolate, 4–8 mm long and c. 0.5–1.0 mm wide, with one prominent vein, dark purple, especially towards outer, glandular, stipitate-glandular, and/or septate-hairy; margins fimbriate. Florets trimorphic, differentiated into pistillate ray florets, pistillate filiform florets, and perfect disc florets. Ray florets thin, pure white when young but turning purplish with age, apically crumpled or rolled up when dry. Filiform florets similar to ray florets but not exceeding the involucre, with corollas shorter than their styles. Disc florets yellow turning pale brown with age, with five lobes. Cypselae ca. 2.0–2.5 mm long, compressed, light brown, pilose. Pappus of numerous fine, whitish, barbellate bristles 5–6 mm long.

Specimens examined: **NEW SOUTH WALES.** Snowy Mountains, *W. Bäuerlen s.n.*, i.1890 (MEL 2158930); Near Kosciusko Hotel, *A.B. Costin s.n.*, iv.1947 (MEL 2158933); Ad torrentis alpium Australia / Berrima, *F. Mueller s.n.* (MEL 603814); Berrima, *F. Mueller s.n.* (K000885081); (Munyang) Mountains on the Upper Hume, *F. Mueller s.n.*, i.1874 (MEL 2158931);

Figure 1. Lectotype of *Erigeron conyzoides*, MEL 2158934, reproduced with permission from the Royal Botanic Gardens Victoria.

Tributaries of the Clarence river, *F. Mueller s.n.* (K000885080, photo seen; NSW 607559, photo seen); White's River, aqueduct, *M.E. Phillips s.n.*, 10.ii.1960 (CBG 20388); Grey Mare Hut, 11 miles ENE of Khancoban, *R. Coveny 2800 & J. Pickard*, 14.iii.1970 (MEL 2158935); Snowy Mountains: Kosciusko National Park. 6.5 km ENE of Mount Kosciusko. Charlottes Pass, 1820 m alt., *D. Verdon 3221*, 9.ii.1978 (CBG 7800865); Kosciusko area, *D. Wimbush s.n.*, 1959 (CANB 58439). **VICTORIA.** Bogong High Plains, Rocky Valley dam, *G.W. Carr s.n.*, 6.ii.1985 (MEL 670729); East Gippsland. Cobberas No.2., W.side, *A.C.Beauglehole 36598 & E.W. Finck*, 27.i.1971 (CANB 558704, MEL 613571, MEL 1504168); Dargo High Plains, Lightbound Creek, *A.C. Beauglehole 41654*, 23.iii.1973 (MEL 1504169); Gippsland, *A.W. Howitt s.n.*, 1888 (MEL 2158938); Eastern highlands, gorge below Howitt Plains, *K.C. Rogers s.n.*, 29.i.1972 (MEL 600315); Eastern highlands, gorge below Howitt Hut, *K.C. Rogers s.n.*, 29.i.1972 (MEL 600723); Falls Creek, *A.N. Schmidt-Lebuhn 2138 & S.H. Chen*, 10.i.2024 (CANB 997869, MEL); Bogong High Plains, in the Basalt Hill – Falls Creek area, *E. Thomason 13*, 1.ii.2000 (MELU D 102645, photo seen); Snowfields, eastern slopes of Mt. Higginbotham, c. 500 m from summit, ca. 50 m below Great Alpine Rd and just south of double chairlift, alt. 1710 m, *N.G. Walsh 2430*, iii.1980 (CANB 721424, HO 562220 *n.v.*, MEL 2339440).

Global distribution: The *Erigeron acris* complex occurs

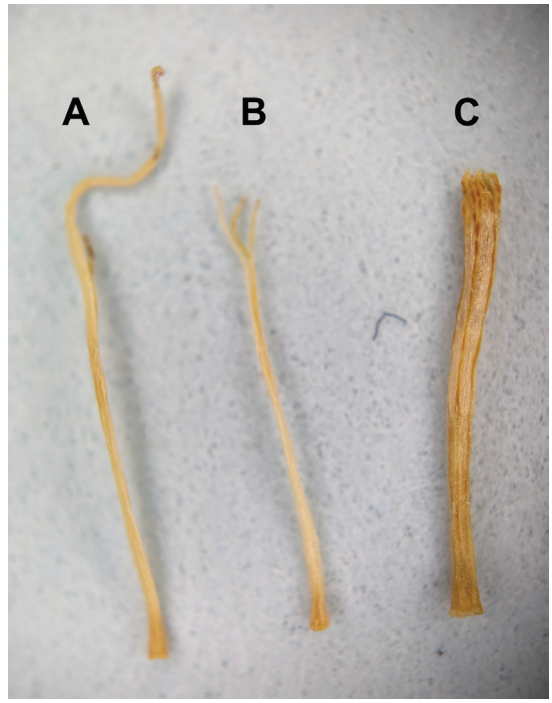

Figure 2. Trimorphic florets of *Erigeron* section *Trimorpha* (Cass.) DC. (*E. conyzoides*, *D. Wimbush s.n.*, CANB 58439). A. Ray floret. B. Filiform floret. C. Tubular disc floret.

Key to the species of *Erigeron* introduced to Australia

1 Florets trimorphic (Fig. 2): outermost are several rows of narrow ray florets, middle are filiform, and inner are disc florets; in Australia an alpine species ..... ***Erigeron acris*** L. (Fig. 3A)

1: Florets dimorphic: outer are either ray florets (in some species barely exceeding the involucre) or filiform, inner are disc florets; lower elevations 2

2 Plants sprawling or ascending, with stem either richly branching from base or not or barely branching; capitula +/- solitary 3

2: Plants erect, with flowering stems branching in upper part into a paniculate capitulescence 4

3 Richly branching from the base, sprawling, with leafy branches; larger stem leaves deeply lobed, smaller ones lanceolate to narrowly elliptic; ray florets white to pink, radiating, exceeding involucre by up to 10 mm; ornamental, occasional garden escape in temperate areas ..... ***Erigeron karvinskianus*** DC. (Fig. 3B)

3: Rosette plants with stems ascending and unbranched or rarely branching; rosette leaves spathulate with wide, flat petiole, and stem leaves reduced, obovate, sessile; ray florets white, not radiating, barely exceeding involucre; inconspicuous weed of moist places, Cairns and vicinity ..... ***Erigeron bellioides*** DC. (Fig. 3C)

4 Basal leaves to 250 x 35 mm, coarsely toothed to lobed; stem leaves much smaller, with margin +/- entire; capitula 8–12 mm long, only up to ca. 7 per capitulescence (but sometimes stem branched into several capitulescences); SE Queensland, NE New South Wales, and Victoria (presumed extinct in Tasmania) ..... ***Erigeron primulifolius*** (Lam.) Greuter (Fig. 3D)

4: Basal and stem leaves not strongly differentiated; capitula 3–6(–8) mm long, numerous; widespread species 5

5 Capitula 3–4 mm long; involucre subglabrous; outer florets rays with very short lip, barely exceeding involucre 6

5: Capitula 4–6 (–8) mm long; involucre hairy; outer florets filiform 7

6 Involucre cylindrical; involucral bracts narrow-oblong; outer florets with lip ca. 1 mm long ..... ***Erigeron canadensis*** L. (including *Erigeron pusillus* Nutt.) (Fig. 3E)

6: Involucre subglobular; involucral bracts narrow-triangular; outer florets with inconspicuous lip <0.5 mm long ..... ***Erigeron bilbaoanus*** (J.Remy) Cabrera (Fig. 3F)

7 Plants to ca. 1 m tall; adaxial/inner surface of senescing phyllaries whitish; pappus white ..... ***Erigeron bonariensis*** L. (Fig. 3G)

7: Plants to ca. 2 m tall; adaxial/inner surface of senescing phyllaries brownish; pappus light brown to straw-coloured ..... ***Erigeron sumatrensis*** Retz. (Fig. 3H)

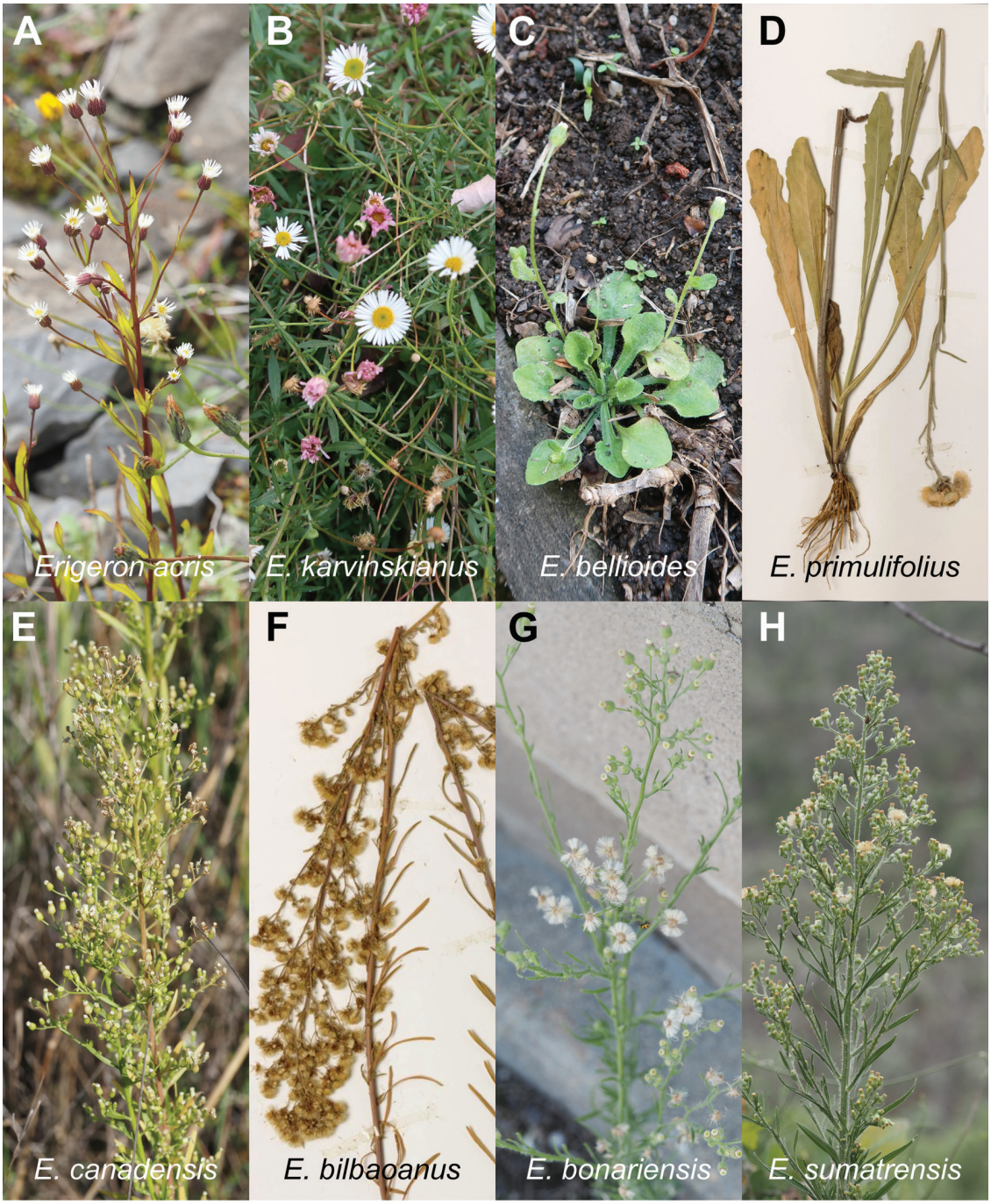

Figure 3. Habit of the eight species of *Erigeron* occurring in Australia. A. *E. acris*. B. *E. karvinskianus*. C. *E. bellioides*. D. *E. primulifolius* (*V. Stajsic 3906 & J. Eichler*, CANB 592670). E. *E. canadensis*. F. *E. bilbaoanus* (*I.C. Clarke 2822*, CANB 509676). G. *E. bonariensis*. H. *E. sumatrensis*. Images A-C, E, and G-H were taken by the first author during field work or vacations in Australia, and D and F by the imaging team of CSIRO's National Research Collections Australia.

across the northern hemisphere, including Canada, USA, most of Europe, Morocco and Algeria, and in Asia from western Russia and the Middle East to Japan and Kamchatka.

Distribution and habitat in Australia: Victorian Alps. It is unknown how many populations remain, but most recently collected only near Falls Creek. Presumed extinct in New South Wales, with no specimens collected since 1978. *Erigeron conyzoides* has been recorded from several sites in Kosciuszko National Park during surveys in 2019 (http://bionet.nsw.gov.au, accessed 22.xii.2023), but no vouchers appear to have been collected. During field work for this study, the species was searched for at one of those recorded locations, namely the area above Thredbo, but not found.

Collectors' habitat notes frequently describe the species as growing between rocks or on rocky substrates, e.g., "on basalt slope" (*B.G. Briggs 2547*, NSW 569129), "amongst volcanic rock" (*G.W. Carr s.n.*, MEL 0670729A), "rocky woodland" (*N.G. Walsh 847*, MEL 0628595A), and "basalt boulder field" (*N.G. Walsh 2430*, CANB 721424, HO 562220, MEL 2339440). Others describe heavily disturbed, anthropogenic sites such as a weedy road verge (*N.G. Walsh 4720*, MEL 2044671A). Sometimes, only forest or subalpine woodland are mentioned, without specifying the substrate (*R.G. Coveny & J. Pickard 2800*, MEL 2158935A, NSW 513746; *M.E. Phillips s.n.*, CBG 20388).

Notes on the epithet: Confusion is evident about the gender of *Erigeron* and the correct form of the epithet of *E. acris*. *Erigeron* was originally treated as neuter by Linnaeus, who accordingly used the name *E. acre* for this species. The current consensus is that *Erigeron* is male (Shenzhen Code, article 62.1), which implies the name *E. acer*, as the correct Latin male form of the adjective (male *acer*, female *acris*, neuter *acre*). However, botanical Latin has created its own traditions that may supersede the constraints of classical Latin, so that using *acris* for male genera is now considered acceptable, and *acer* somewhat archaic (Stearn, 2008: 11).

***Erigeron bellioides* DC., Prodr. 5: 288 (1836).**

Type: **PUERTO RICO.** *C.L.G. Bertero s.n.* (G00494646).

Annual rosette herb to ca. 5 cm tall. Stems one to several per plant, ascending, unbranched or rarely sparsely branched, moderately covered with thin, straight, spreading or appressed hairs, with very reduced, obovate leaves in lower half. Rosette leaves spathulate, usually to ca. 15(–20) mm long (including petiole) and ca. 6(–9) mm wide, moderately covered with thin, straight to slightly curved, spreading hairs especially on petiole and margins; lamina suborbicular, sparsely crenate to ± entire; petiole flattened and usually longer than lamina. Capitula solitary or rarely 2 or 3 per stem. Involucre of ca. two irregular rows; phyllaries lanceolate, mostly ca. 2.0 mm long and c. 0.2–0.4 mm wide (some of the outer phyllaries much reduced in size), with one prominent vein, green, moderately covered with thin septate hairs; margins serrate, white. Florets dimorphic, differentiated into pistillate ray florets and perfect disc florets. Ray florets white, not radiating, barely exceeding involucre, with apex curling up as the capitulum matures. Disc florets yellow, with five lobes. Cypselae ca. 1 mm long, compressed, light brown, pilose. Pappus of numerous fine, whitish, barbellate bristles ca. 1.5 mm long.

Specimens examined: **QUEENSLAND.** Cook district, Yorkeys Knob, *F.A. Zich 680*, 27 ix. 2013 (AK *n.v.*, BRI *n.v.*, CANB 822051, CNS 139962 *n.v.*); Cairns, urban area, *A.N. Schmidt-Lebuhn 2114*, 2023 (CANB 996023).

Global distribution: Native to the Caribbean. Introduced to USA, southeastern Asia, and many parts of the Pacific (e.g., Micronesia).

Distribution in Australia: Actively spreading around Cairns and vicinity and the Atherton Tablelands.

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