Nuytsia The journal of the Western Australian Herbarium

24: 29–35 Published online 1 May 2014

SHORT COMMUNICATION

Stylidium lithophilum and *S. oreophilum* (Stylidiaceae), two new species of conservation significance from Stirling Range National Park

Stylidium lithophilum Wege, *sp. nov.*

Type: Stirling Range National Park, Western Australia [precise locality withheld for conservation reasons], 30 November 2011, *J.A. Wege, W.S. Armbruster & M. Matsuki* JAW 1907 (*holotype*: PERTH 08526303; *isotypes*: CANB, K, MEL).

Compact perennial herb 3.5–20 cm high with *stems* shortly elongated to *c*. 5 cm and a little swollen at nodes, unbranched or branching at nodes, glabrous, propped above the soil surface by stilt roots. *Glandular trichomes* 0.1–0.3 mm long, with translucent to yellowish stalks and yellow or reddish black, turbinoid or discoid heads. *Leaves* in erect tufts at stem apex, ± scattered below, narrowly oblanceolate, (0.5–)1–3 cm long, 1–2.8 mm wide, acute and bearing a small blunt callus, entire, faintly striate, with both glandular hairs and minute papillae. *Scapes* 2.5–13 cm long, 0.4–1 mm wide, smooth, often with 1 or 2 sterile bracts below the inflorescence, glabrous; sterile bracts narrowly oblanceolate to subulate to linear-lanceolate, 3.5–8 mm long, acute, entire, with glandular hairs and minute papillae. *Inflorescence* racemiform, 4–23-flowered; bracts subulate, 1.5–4.5 mm long, acute, the margin entire and finely hyaline, the surface with glandular hairs and minute papillae; prophylls similar to bracts but smaller, positioned on the pedicels; pedicels 5–18 mm long, glandular-hairy above prophylls. *Hypanthium* oblong to clavate, *c.* ellipsoid in T.S. and a little constricted between the locules, 2.5–4 mm long, 0.9–1.3 mm wide, with very faint longitudinal ridges, glabrous or with a few glandular hairs near the base. *Calyx lobes* free, *c.* equal in length but with 2 slightly broader than the remaining 3, 2–3.5 mm long, 0.6–1.2 mm wide, subacute to obtuse, the margin entire and finely hyaline, with glandular hairs towards the apex and on the margin. *Corolla* tube 1–1.5 mm long; lobes pale yellow with a dark yellow throat, paired laterally, glabrous; anterior lobes elliptic to narrowly ovate, somewhat arcuate on anterior side, a little larger than the posterior pair, 4–6.5 mm long, 2.5–3.8 mm wide; posterior lobes elliptic to narrowly ovate, 4–6 mm long, 2.2–3.3 mm wide. *Labellum* reflexed and angled across the calyx, ovate, 0.6–1 mm long, 0.4–0.5 mm wide, with a terminal appendage 0.4–1 mm long, glabrous; lateral appendages absent. *Throat appendages* 6 or 8 (the anterior-most protuberances either reduced in size or absent), arranged in 2 groups of 3 or 4 separated by a swollen mound, dark golden yellow, irregularly oblong, a little swollen at base but laterally flattened in upper portion and tapering to an acute or emarginate apex, 0.1–1 mm high, glabrous. *Column* 8–9.5 mm long, straight when extended, glabrous; subtending anther hairs absent; stigma subsessile, entire, globose. *Capsules* and *seeds n.v.* (Figure 1A–E)

Diagnostic features. The following features distinguish *S. lithophilum* from all other species in the genus: a stilted habit with short, glabrous stems; a tuft of narrowly oblanceolate and faintly striate leaves to 3 cm long, densely covered with inconspicuous papillae and yellow-headed glandular hairs; glabrous scapes with glandular-hairy bracts, prophylls, pedicels and calyx lobes; pale yellow, laterally-paired corolla lobes with dark yellow, glabrous throat appendages; a column 8–9.5 mm long.

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ISSN 2200-2790 (Online)
ISSN 0085-4417 (Print)

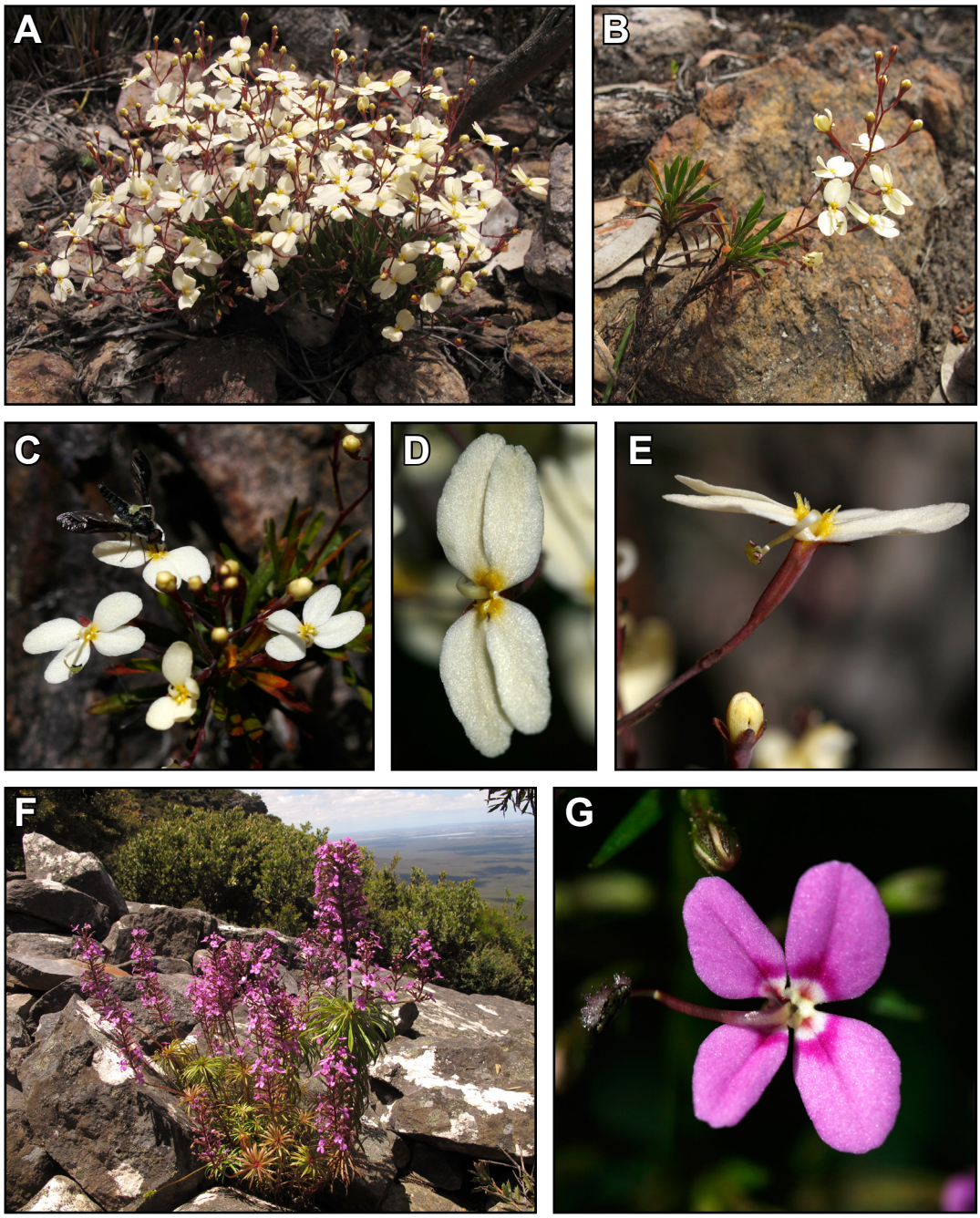

Figure 1. *Stylidium lithophilum* (A–E) and *S. oreophilum* (F, G). A – compact individual of *S. lithophilum* showing a posy-like floral display; B – a sparingly-branched individual showing the shortly elongated stems and stilted habit; C – pollination by bee-fly (Bombyliidae); D – corolla with pale yellow lobes and darker yellow throat appendages but lacking contrasting throat markings; E – side view of the flower showing the mostly glabrous hypanthium and irregular throat appendages; F – a robust individual of *S. oreophilum*, with numerous leafy stems and a spectacular floral display; G – flower of *S. oreophilum* with the column resetting, showing the prominent corolla markings. Photographs J. Wege from *J.A. Wege, W.S. Armbruster & M. Matsuki* JAW 1907 (A–E), *J.A. Wege & B.P. Miller* JAW 1912 (F), and *J.A. Wege & B.P. Miller* JAW 1910 (G).

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 26 Nov. 1980, *R.J. Cumming* 1016 (PERTH); 22 Nov. 2004, *J.A. Wege & K.A. Shepherd* JAW 1291 (PERTH).

Common name. Mountain bouquet triggerplant.

Phenology. Flowers from the second half of November to the end of December.

Distribution and habitat. *Stylidium lithophilum* is currently known from a south-facing rocky mountain slope in Stirling Range National Park where it grows in yellowish brown, clayey sand with outcropping sandstone and shale, in mallee and *Banksia* shrubland. It co-occurs with *S. spinulosum* R.Br. subsp. *montanum* Carlquist at the type locality and also with *S. scandens* R.Br. at a slightly higher elevation.

Conservation status. To be listed as Priority Two under Department of Parks and Wildlife Conservation Codes for Western Australian Flora (A. Jones pers. comm.). *Stylidium lithophilum* is known from a single population within a National Park, with further survey required to ascertain its precise conservation status.

Etymology. From the Greek *lithos* (stone, rock) and *-philus* (-loving), in reference to the rocky habitat of this species.

Affinities. *Stylidium lithophilum* is one of a number triggerplants from *S.* subgen. *Tolypangium* (Endl.) Mildbr. sect. *Saxifragoidea* Mildbr. with pale yellow, laterally-paired corolla lobes and glandular-hairy leaves. It was first collected in 1980 by R.J. Cumming, who identified it as having an affinity with *S. spathulatum* R.Br., a species that differs in a number of features including the presence of red markings in the throat of the corolla, the presence of glandular hairs on the stems and lower scapes, the absence of papillae on the leaves and of glandular hairs on the bracts, prophylls and calyx lobes, and throat appendage morphology. *Stylidium spathulatum*, which tends to have larger leaves than those of *S. lithophilum*, is broadly distributed in the south of the state but is not recorded from the Stirling Range.

Stylidium lithophilum is morphological close to *S. rupestre* Sond., a species with a similarly branched habit, striate leaves (often with shiny secretions), and similar flowers. *Stylidium rupestre* is distributed across the south coast of Western Australia, from Cape Arid to Cape Riche, extending as far north as the Stirling Range (although is not known to overlap in distribution with *S. lithophilum*). Unlike *S. lithophilum*, which lacks markings on the corolla lobes, *S. rupestre* has red or reddish throat markings and reddish maroon markings on the lower surface. *Stylidium rupestre* lacks the minute papillae found on the leaves and floral bracts of *S. lithophilum* and its floral bracts are ovate rather than subulate to narrowly oblanceolate. The two species also differ in the distribution of glandular hairs, most notably on the stems (absent in *S. lithophilum*, present in *S. rupestre*), scapes (absent in *S. lithophilum*, present throughout the length of the scape in populations of *S. rupestre* from the Stirling Range to Cape Riche, restricted to the lower portion of the scape in populations further to the east, and very rarely completely glabrous in populations east of Esperance) and throat appendages (absent in *S. lithophilum*, present in *S. rupestre*). *Stylidium lithophilum* tends to have shorter stem innovations, slightly longer leaves and more numerous flowers; however, these features are somewhat variable across both species.

Stylidium lithophilum may be confused with *S. glandulosissimum* Wege (also recorded for the Stirling Range), *S. diademum* Wege (occurs in the nearby Porongurup Range), and *S. gloeophyllum* Wege

(recorded from the plains south of the Stirling Range). These three species all have tufts of glandular-hairy leaves and pale yellow, laterally-paired corolla lobes. *Stylidium lithophilum* differs from all three species in the presence of minute papillae (as well as glandular hairs) on the leaves. *Stylidium glandulosissimum* is most readily distinguished from *S. lithophilum* by its dense indumentum of glandular hairs on the leaves, scapes and inflorescences, and its longer column (12.5–14 mm long). *Stylidium diademum* can be further differentiated from *S. lithophilum* by the presence of red markings on the underside of the corolla lobes (and therefore on the buds), the presence of glandular hairs at the tips of the throat appendages, and its ellipsoid hypanthium and longer column (11–13 mm long). *Stylidium diademum* also tends to have a more slender habit and longer scapes (to 45 cm high) with more flowers (up to 40, although smaller individuals have as few as five). *Stylidium gloeophyllum* is easily distinguished from *S. lithophilum* by its compact stems that remain at ground level rather than being elevated above the soil by stilt roots, its longer and broader leaves (1.5–7 cm × 2–12 mm), the presence of glandular hairs on the lower portion of the scape, and its glabrous and partly connate calyx lobes.

Stylidium oreophilum Wege, *sp. nov.*

Type: Stirling Range National Park, Western Australia [precise locality withheld for conservation reasons], 23 December 2011, *J.A. Wege & B.P. Miller* JAW 1912 (*holotype*: PERTH 08526273 [sheet 1 of 2], PERTH 08526281 [sheet 2 of 2]).

Shrubby, robust perennial herb (15–)25–60 cm high with numerous, erect, woody *stems* arising from toward the base of an evenly thickened and partially buried central stem, or from discrete growth nodes positioned at or near ground level; stilt roots sometimes present near base of plant; *stems* straw-coloured with a pinkish red tinge, 10–35 cm long, 1–7 mm wide, glabrous. *Glandular trichomes* 0.2–0.3 mm long, with translucent stalks and pale reddish, ellipsoid to obloid heads. *Leaves* scattered along stems and crowded in a terminal, spreading tuft, narrowly oblanceolate to almost linear, (1–)2–7 cm long, (0.5–)1–4 mm wide, acute and bearing a small blunt callus, the margin entire and somewhat recurved (particularly in dried material), with obscure veins, glabrous. *Scapes* 11–18 cm high, 1–4 mm wide, with numerous longitudinal ridges, glabrous or sparsely glandular-hairy near tip; sterile bracts absent. *Inflorescence* a closed thyrse or racemiform, 22–*c*. 150-flowered, the inflorescence units 1–7-flowered with peduncles 0.5–25 mm long; bracts narrowly lanceolate, 5–21 mm long, acute, entire, glabrous; prophylls paired at base of hypanthium, subulate to narrowly lanceolate or linear, 1.8–5 mm long, glabrous; flowers subsessile, with pedicels to 0.5 mm long, glabrous. *Hypanthium* oblong to linear, usually somewhat falcate (curving upwards), slightly constricted toward the apex but swollen below the calyx, lopsided in T.S. with the upper (axial) cell abortive and reduced to a filiform rib and the lower cell fertile and faintly longitudinally ribbed, 7–15 mm long, 1.2–1.5 mm wide, glandular-hairy distally. *Calyx lobes* free, somewhat unequal in length, 2–4.5 mm long, 0.7–1 mm wide, acute, entire, glabrous or sparsely glandular-hairy towards the base. *Corolla* tube 2–3.5 mm long; lobes deep pink or purplish pink with dark pink or purplish pink outer markings, pinkish red inner markings and a creamy white throat, paired laterally, abaxially glandular-hairy; anterior lobes elliptic to ovate, arcuate along anterior edge, usually a little smaller than the posterior pair, 4–6.8 mm long, 2.8–4.2 mm wide; posterior lobes obovate, ovate or elliptic, 4.5–6.3 mm long, 3–4.2 mm wide. *Labellum* reflexed, ovate, 0.9–1.2 mm long, 0.7–1.2 mm wide, with a terminal appendage 0.2–0.7 mm long and lateral appendages 0.2–0.7 mm long, sparsely glandular-hairy on the margin or abaxial surface. *Throat appendages* absent. *Column* 11–13.5 mm long, with a slight lateral curve when extended, angled sharply at apex so that the anther locules are held perpendicular to column, glabrous except for subtending anther hairs; stigma sessile, entire. *Capsules* oblong, constricted toward the apex, *c.* 10–16 mm long; *seeds c.* 1 mm long, 0.5 mm wide, apparently unevenly papillate. (Figure 1F, G)

Diagnostic features. The following features distinguish *S. oreophilum* from all other species in the genus: a robust, woody habit with numerous, erect leafy stems arising from near the base of the plant; an oblong to linear hypanthium which is narrowed toward the apex, with the upper ovary cell reduced to a narrow rib and lacking ovules; calyx lobes 2–3.5 mm long; deep pink or purplish pink, laterally-paired corolla lobes that are 4–6.8 mm long and without throat appendages; a long column (11–13.5 mm); mostly summer flowering.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 26 Feb. 1995, *S. Barrett* 331.4 (PERTH); 14 Nov. 1959, *A.S. George* 420 (PERTH); 5 Dec. 2013, *D.A. Rathbone* DAR 1018 (PERTH); 22 Dec. 2011, *J.A. Wege & B.P. Miller* JAW 1910 (CANB, MEL, PERTH).

Common name. Bushy mountain triggerplant.

Phenology. Flowers have been recorded from mid-November to January, with peak flowering in late December to early January.

Distribution and habitat. *Stylidium oreophilum* is known from south-facing mountain slopes in Stirling Range National Park where it grows in loamy soils under rocky sandstone ledges and amongst boulders and scree. *J.A. Wege & B.P. Miller* JAW 1912 was collected from thickets of *Hakea*, *Gastrolobium* and *Calothamnus*, and at the type locality it was noted to occur with both *Stylidium bellum* Wege and *S. spinulosum* subsp. *montanum*. A recently discovered, disjunct population at Mt Manypeaks (*D.A. Rathbone* DAR 1018) occurs in a similarly south-facing habitat, with plants growing among granite boulders in association with *Lepidosperma* and *Platysace*.

Conservation status. To be listed as Priority Two under Department of Parks and Wildlife Conservation Codes for Western Australian Flora (A. Jones pers. comm.). Specimens have been collected from three sites within the Stirling Range (although it is thought to be present on some additional peaks: S. Barrett and D. Rathbone pers. comm.) and from one location on Mt Manypeaks. Populations sizes appear to be small, with damage occurring to some individuals growing alongside hiking trails in the Stirling Range.

Etymology. From the Greek *oreo-* (pertaining to mountains) and *-philus* (-loving).

Affinities. *Stylidium oreophilum* is one of a small number of taxa from *S.* subgen. *Tolypangium* (Endl.) Mildbr. sect. *Rhynchangium* Benth., a distinctive group of woody subshrubs with elongated hypanthia that are constricted to varying degrees toward the apex (*i.e.* beaked; see Erickson (1958), Plates 25, 26). Within this section, *S. oreophilum* is morphologically most similar to *S. adnatum* R.Br. and *S. fasciculatum* R.Br. with which it shares pale, glabrous stems and elongated, longitudinally-ridged and glabrous (or mostly glabrous) scapes. *Stylidium oreophilum* and *S. adnatum* both have an infertile upper ovary loculus that is reduced to a narrow rib, a feature that is unique within the genus. In contrast, *S. fasciculatum* has two fertile ovary cells that are equal or subequal in size. This is the most reliable feature for separating *S. oreophilum* from *S. fasciculatum*, the two species otherwise sharing a more or less comparable floral morphology (although the corolla lobes in *S. fasciculatum* vary from white to deep pink, and its column is a fraction shorter at *c.* 8–11.5 mm long). *Stylidium adnatum* can be distinguished from *S. oreophilum* by several floral features, including its paler and smaller corolla lobes (2.5–3.5 × 1.8–2.3 mm), shorter calyx lobes (<2 mm long), shorter column (6–7 mm long), and by the absence of lateral appendages on the labellum.

These three species differ subtly from one another in habit. *Stylidium adnatum* is characterised by a shallowly buried basal stem node (lignotuber) from which multiple stems (and occasionally leafless stolons) arise. Plants are usually geophytic, dying back to the lignotuber after fruiting, and as a result distinct growth nodes on the stems (from which stilt roots often arise) are absent. Occasionally, if there is sufficient water available, the stems can persist over the summer months, with new season's shoots subsequently arising from the apical node (in addition to the basal lignotuber). Adventitious roots tend to only form from the apical node if it comes in contact with the soil.

Stylidium fasciculatum also has a basal stem node although it is often less well-developed than in *S. adnatum* and is often positioned just above the soil surface. The stems tend to persist over summer, with plants producing one or more shoots from distinct growth nodes and forming stilt roots from the lower nodes; however, there are some specimens in which only a basal node is evident. *Stylidium fasciculatum* is a somewhat variable taxon that remains the subject of ongoing taxonomic investigation.

I am uncertain whether a large lignotuber develops in *S. oreophilum*, since I have seen a limited number of plants in the field and have only excavated one complete individual (the holotype). In this specimen, discrete growth nodes are absent. The lower portion of the central stem is evenly thickened over its length (including the buried portion) and gives rise to numerous erect stems and thick adventitious roots. In contrast, *J.A. Wege & B.P. Miller* 1910 is a cutting taken from a large individual with more than 20 stems originating from two (or possibly more) separate growth nodes. The nodes are separated by a short internode, were positioned at or very near the soil surface and adventitious roots were not observed. A similar habit is evident in the recent collection from Mt Manypeaks, a specimen in which traces of the previous season's stem tissue remain attached to the lower nodes, indicating that the stems do indeed die back to these lower nodes after the plant sets fruit.

Stylidium adnatum is a widespread species, occurring from near Bunbury, south to Augusta and east to Cape Arid National Park. It does not occur in the Stirling Range (the closest populations are in the nearby Porongurup Range where it grows on rocky granite slopes in karri forest), and is not recorded for Mt Manypeaks (although it is known from nearby Waychinicup Inlet where it grows in sand over granite in coastal scrub). *Stylidium adnatum* tends to have an earlier flowering time than *S. oreophilum*, commencing towards the end of September and with peak flowering from mid-October to the end of November (although flowering can extend into early January). *Stylidium fasciculatum* similarly does not occur in the Stirling Range or the Mt Manypeaks area, extending from Cape Naturaliste to the Albany region. It also tends to bloom earlier than *S. oreophilum*, with most flowering records collected between October and mid-December, although summer flowering is known, particularly in wetter areas (or perhaps in response to heavy summer rains).

Notes. *Stylidium oreophilum* was brought to my attention by Scott Armbruster and Mamoru Matsuki, who uncovered the type population whilst I was making the type gathering of *S. lithophilum* at a lower elevation. At this time, *S. oreophilum* was mostly in bud, necessitating a return visit to the site several weeks later to make an adequate flowering collection. In the intervening period, I examined herbarium collections of allied taxa and discovered two additional collections from different peaks in the Stirling Range, the first by Alex George in 1959, the second by Sarah Barrett in 1995.

Stylidium oreophilum has horticultural potential in view of its attractive, leafy habit, hardy stems and spectacular, floriferous inflorescences of brightly coloured flowers. Glasshouse trials at the Botanic Gardens and Parks Authority are proving promising (D. Growns pers. comm.).

Acknowledgements

I thank Scott Armbruster and Mamoru Matsuki who, as promised, found a new triggerplant growing on top of a mountain, thereby ensuring I would have to climb it; Ben Miller and Kelly Shepherd for additional field assistance; Damian Rathbone for his recent collection effort and photographs and for sharing his regional expertise; Libby Sandiford and Sarah Barrett for additional observational data; the Stirling Range National Park Rangers for on-ground support; Digby Growns for his horticultural efforts; and Kevin Thiele and Russell Barrett for comments on the manuscript. This publication was financed by the Australian Biological Resources Study, Karara Mining Ltd and the Department of Parks and Wildlife (in part through a Specific Nature Conservation Project grant under the then Department of Environment and Conservation).

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