Nuytsia The journal of the Western Australian Herbarium

32: 159–165 Published online 9 December 2021

Convolvulus pyrophilus (Convolvulaceae), a new post-fire ephemeral, and an updated illustrated key to the Western Australian species

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SHORT COMMUNICATION

Convolvulus L. is a cosmopolitan genus of nearly 200 species (Wood *et al.* 2015; POWO 2021), with 14 currently recognised in Australia (CHAH 2021). The new species described here brings to seven the number occurring in Western Australia, two of which are introduced. Although neither of the introductions is apparently posing a problem at this stage, monitoring is recommended since *C. arvensis* L. is an agricultural weed in many parts of the world, including some parts of Australia, and *C. sabatius* Viv., which is available on the horticultural market, is noted as a naturalised alien in some parts of Europe (Randall 2007; Arianoutsou *et al.* 2010; Hrusevar *et al.* 2017). It had been accepted that all Australian native species were perennial herbs (Wood *et al.* 2015; Johnson 2001) but the recently discovered species described below has proven to be an annual, post-fire ephemeral plant. The new species germinates in depressions of mallee shrublands after winter rainfalls only following bushfires, and it dies off in the following autumn after producing numerous seeds that lay dormant until there is another fire.

Convolvulus pyrophilus O.Nazarova & Hislop, *sp. nov.*

Type: north side of the Lake King-Norseman Road, Western Australia [precise locality withheld for conservation reasons], 22 November 2020, *O. Nazarova* 120 (*holo*: PERTH 09379975; *iso*: AD, CANB, MEL).

Convolvulus sp. Cascades (W. Archer 1110161), Western Australian Herbarium, in *Florabase*, https://florabase.dpaw.wa.gov.au/ [accessed 5 August 2021].

Annual, post-fire ephemeral, prostrate *herb*, often mat-forming, and up to at least 2.5 m across, or occasionally twining where support is present. Primary *roots* are shallow, thin, with a few slender lateral roots. *Stems* terete, with sparse appressed hairs, 0.2–0.35 mm long. *Leaves* petiolate, alternate, bright green with a glossy adaxial surface. *Petioles* up to 30 mm long, with sparse, appressed hairs, 0.2–0.25 mm long; basal leaf petioles often longer than the blade then becoming progressively shorter on stem leaves. *Leaf blade* broadly ovate to deltate, 6–27 mm long, 4–24 mm wide, with sparse appressed hairs, 0.18–0.32 mm long; venation prominent; margins more or less regularly crenate or undulate; apex often emarginate, mucronate, occasionally retuse or rarely attenuate; base truncate and

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

slightly decurrent onto the petiole, sometimes slightly sagittate. *Inflorescence* axillary, cymose, one or two per axil, up to 5-flowered. *Peduncle* filiform, 4–55 mm long, with sparse, appressed hairs; *pedicel* 5–10 mm long, hairs as for peduncle, erect in fruit. *Bracteoles* sub-opposite to opposite, subulate to linear, 0.8–1.2 mm long, 0.25–0.4 mm wide, apex acute, moderately to densely hairy on adaxial surface, sparingly hairy or glabrous on abaxial surface. *Sepals* mostly light green, paler towards the margins; broadly elliptic to obovate; apex obtuse to rounded, emarginate and shortly mucronate or apiculate, with hyaline margins *c*. 0.5–1 mm wide; outer sepals 4–5 mm long, 3–3.5 mm wide, sparsely appressed-hairy, slightly more densely towards the apex; inner sepals 3.7–4 mm long, 2.5–2.9 mm wide, glabrous or with rare hairs. *Corolla* funnelform, 6.5–7 mm long, apparently not fully opening at anthesis, light pink with five paler longitudinal bands, weakly lobed, lobes 2.6–3 mm long, glabrous except for hairs on the upper, outer portion of the longitudinal bands; throat light greenish cream, 2.2–2.5 mm diameter. *Stamens* five, slightly unequal in length; *filaments* adnate to the corolla tube for 1.8–2 mm above the base, free for 1.6–2 mm, with short tubercles on the adnate part and lower part of the free portion of the filaments; *anthers* closely surrounding the stigmas (*c*. ½ way from the stigmas base), oblong, becoming deltate at dehiscence, *c*. 0.4–0.7 mm long, 0.3–0.42 mm wide; apex obtuse, becoming emarginate at dehiscence, base sagittate; *pollen* grains three-colpate. *Ovary* ovoid, 0.8–1.0 mm long, on a prominent disk, 0.2–0.3 mm high, mostly glabrous, but with a very occasional long hair; *style* glabrous 2–2.2 mm long, tapering gradually from ovary apex, with two cylindrical obtuse stigmas, 1–1.5 mm long. *Capsule* globular to globular-obovoid 5.3–7 mm long, 5.5–6.5 mm diameter, glabrous. *Seeds* 4, ¼-globose, slightly concave in the middle of outer and both inner surfaces, 2.6–3 mm long, 1.9–2.5 mm wide, black or dark brown, somewhat glossy, obtuse at the base; surface finely punctate, bearing sparse low, irregular, flat tubercles and +/– anastomosing ridges; outer margin a narrow, irregular, discontinuous wing. (Figure 1, 2 A)

Diagnostic features. Distinguished from other species within the genus by its post-fire ephemeral biology, small flowers, and shiny, bright green, relatively uniform, broadly ovate or deltate leaves with more or less regularly crenate or undulate margins and the absence of basal lobes. The consistently sparsely appressed-hairy vegetative parts and mostly prostrate habit are also notable.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 11 Oct. 2016, *W. Archer* 1110161 (PERTH); 31 Oct. 2016, *W. Archer* 3110161 (AD, CANB, PERTH); 29 Oct. 1997, *B.J. Lepschi* & *B.A. Fuhrer* BJL 3805 (AD, BRI, CANB, PERTH); 22 Dec. 2020, *E. Massenbauer* EM 926 (PERTH 2 sheets).

Phenology. All collections have both flowers and fruit present and were made between October and December. Observations by the first author at the type location and that of *E. Massenbauer* 926, showed that all plants had died by April of 2021, i.e. four or five months after the collection dates and 13–14 months after the fire event. This corresponds with the observations made earlier by William Archer at the site of another population where no plants were evident a year after the collecting date.

Distribution and habitat. Currently known from three disjunct localities: east of Lake King and north and south of Cascade, in the Eastern Mallee and Recherche IBRA Subregions. Occurs on gravelly brown, yellow or reddish sandy loam in depressions or shallow drainage lines in recently burnt mallee woodlands. Associated species include others that are often prominent in the aftermath of recent fire such as *Trachymene anisocarpa*, *Austrostipa* sp., *Bulbine* sp. and *Haloragis digyna*.

Conservation status. Currently listed as Priority One under the Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), under the name *C.* sp. Cascades (W. Archer 1110161). Because of its post-fire ephemeral biology, the true extent of its distribution and hence the

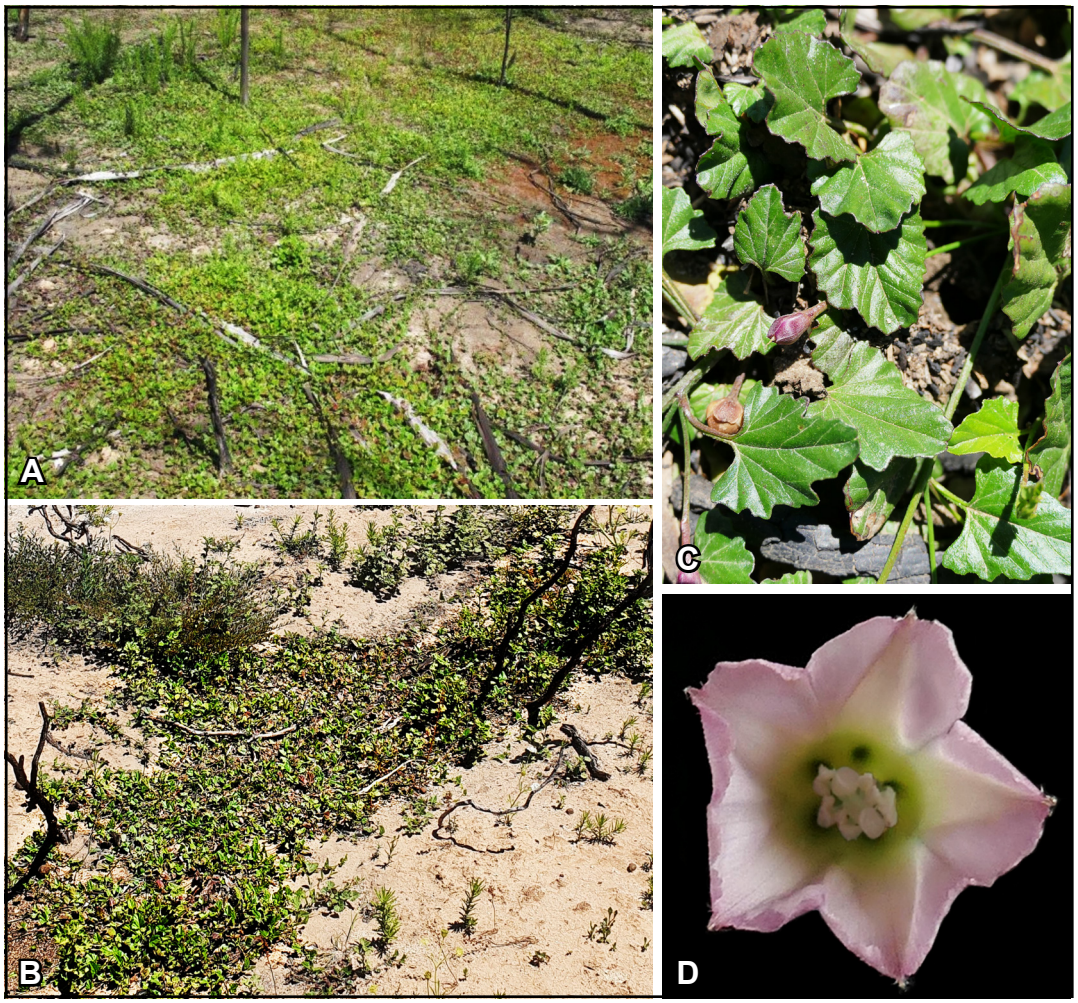

Figure 1. *Convolvulus pyrophilus*. A and B – mat-forming habit in depressions (A) and shallow drainage lines (B) in recently burnt open mallee woodlands; C – leaves *in situ*; D – flower, showing characteristic half-opened appearance with the anthers crowded around stigmas. Voucher: *O. Nazarova* 120. Images: W. Archer (A) and O. Nazarova (B–D).

most appropriate conservation rank will always be problematic to some extent. It seems worth noting, however, that only two small populations were located by the first author and local Flora Conservation Officer, Emma Adams (formerly E. Massenbauer), during searches of a number of similar post-fire habitats.

Etymology. The epithet is from the Greek *pyros* (fire) and *phileo* (to love) and refers to the germination of this species after fire.

Affinities. The only species likely to be confused with *Convolvulus pyrophilus* is *C. remotus* R.Br., Aside from its different biology *C. pyrophilus* differs from that species in having broadly ovate or deltate leaves without basal lobes (*cf.* narrowly ovate, oblong, narrowly triangular to linear, with prominent basal lobes present), glossy green foliage (*cf.* dull green), leaf margins that are crenate or undulate (*cf.* entire) and smaller corollas, 6.5–7 mm long (*cf.* 8–18 mm).

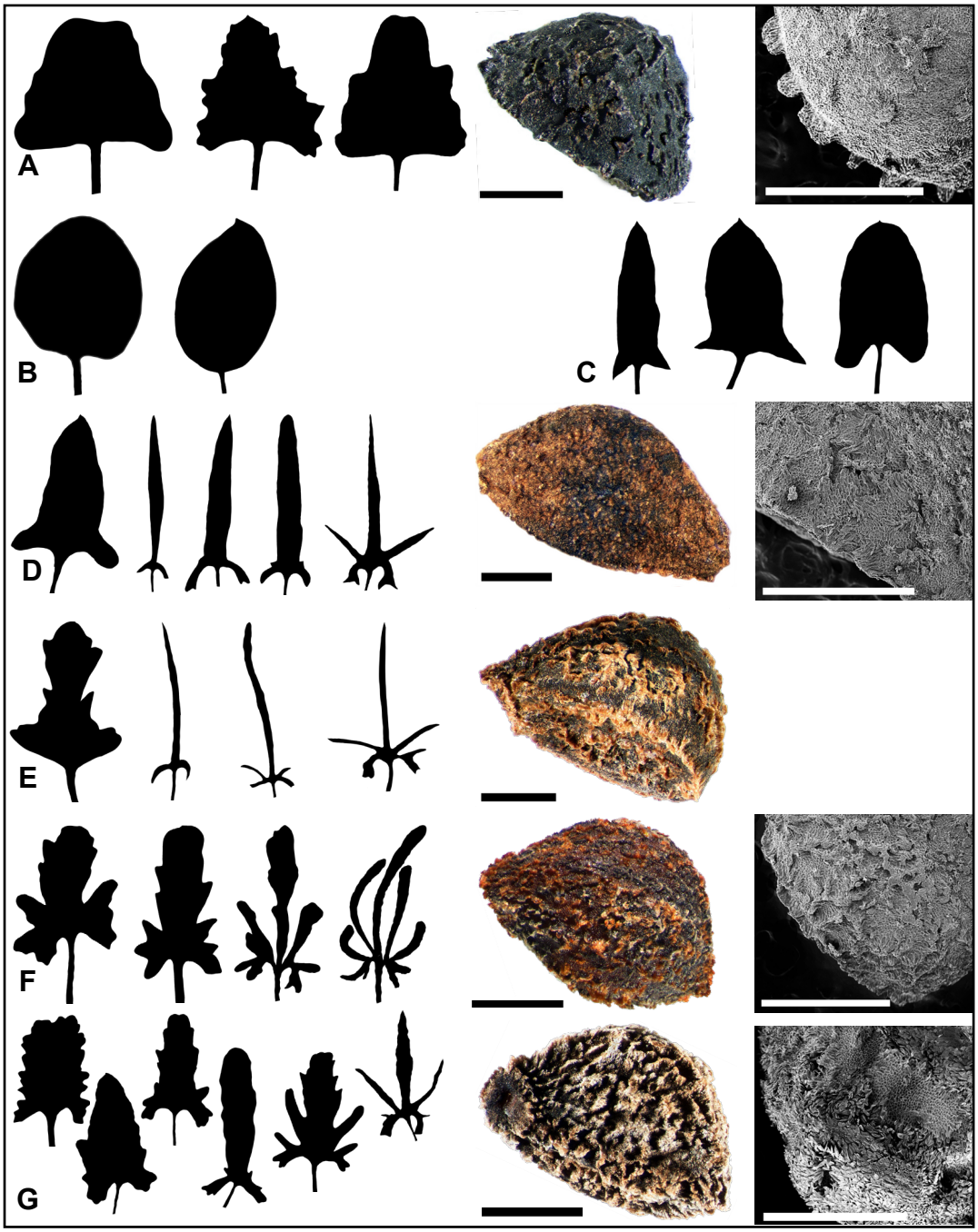

Figure 2. Comparative stem leaf and seed morphology of *Convolvulus pyrophilus* (A), **C. sabatius* subsp. *mauritanicus* (B), **C. arvensis* (C), *C. remotus* (D), *C. angustissimus* (E), *C. recurvatus* subsp. *nullarborensis* (F) and *C. clementii* (G). Leaf images represent composites of stem leaves from the following specimens: *O. Nazarova* 120 (A); *G.J. Keighery* 14041 (B); *G.J. Keighery* 9396, *J.P. Simpson s.n.* (PERTH 05825946) (C); *A.S. George* 11317, *K.R. Newbey* 7492, *R.D. Royce* 5231, *I.B. Shepherd* 181, (D); *C. Andrews s.n.* (PERTH 05826373), *G.J. Keighery* 5655, *J.A.L. Preiss* 1925 (MEL 0689916A_ISOTYPE) (E); *T.E.H. Aplin* 1671, *E.R.LJohnson* 12, *D. Lynch* DL 56 (F); *K.A. Atkins* 650, *B.J. Lepschi* 2065, *M.N. Lyons* & *R.A. Coppen*, FV 0706, *K. McCreery* GIR 16-37, *P. de Rebeira* 81 (G). Seed images taken at × 3 mag by O. Nazarova and scanning electron microscopy images taken by S. Dillon from: *O. Nazarova* 120 (A), *T.E.H. Aplin* & *M.E. Trudgen* 5762 (D), *C. Andrews s.n.* (PERTH 05826373) (E), *E.R.L. Johnson* 12 (F), *P.G. Wilson* 9920 (G). Seeds scale bars = 1 mm.

Notes. An interesting feature of *C. pyrophilus* noted by the first author and two other collectors of the species, is that the flowers may not open fully at anthesis. This raises the possibility that they are self-pollinating, which is a strategy that may have advantages in plants that produce flowers quickly in the months after major fire events when potential pollinators are likely to be scarce.

The seeds of *C. pyrophilus* germinate well after smoke-water treatment. It is noteworthy that potted plants were able to twine at least to 30 cm because *in situ* plants usually appear as dense mats, due to the absence of suitable support in the postfire environment.

Other morphological variations to note include: Leaf shape and indumentum does not depend on leaf position (base or stem) but rather on maturity. Petioles, leaves, peduncles and pedicels often become progressively shorter from the base upwards. Blades of juvenile leaves are more deltate in shape. Young leaves, petioles, pedicels and buds are hairier, becoming sparser with age. Surfaces of vegetative parts (stem, leaves and sepals) exposed to sun are often tinted purple.

Key to Western Australian species of *Convolvulus*

* alien to Western Australia
⅀ occurs more than once in the key

1. Leaves on individual plants relatively uniform in shape, basal lobes absent or if present then usually entire, the central lobe always without further divisions

2. Corolla 6.5–7 mm long; leaf margins crenate and often undulate, never entire (Figure 2A); post-fire ephemeral ..... **C. pyrophilus**

2: Corolla 8–30 mm long; leaf margins entire, apart from basal lobes in *C. remotus* and *C. arvensis*; perennial herbs

3. Corolla blue or violet; leaves broadly ovate to suborbicular, basal lobes absent (Figure 2B)..... ***C. sabatius** subsp. **mauritanicus**

3: Corolla pink or white; leaves broadly to narrowly ovate, oblong, narrowly triangular to linear, basal lobes present

4. Stems ±quadrangular, or rare narrowly winged, ± glabrous or with an indumentum ± spreading hairs; outer sepals distinctly narrower then inner, corolla 15–30 mm; basal leaf lobes always entire (Figure 2C)..... ***C. arvensis**

4: Stems terete, with an indumentum of mostly appressed hairs; outer sepals not distinctly narrower then inner, corolla 8–18 mm long; basal leaf lobes not always entire, may possess ascending secondary lobes (Figure 2D)..... **C. remotus**⅀

1: Leaves on individual plants usually variously shaped, basal lobes often further divided into secondary lobes, sometimes the central lobe itself with secondary lobes

5. Fruiting pedicel recurved

6. Leaves 10–65 mm long, central lobe margin mostly entire, ascending secondary lobes when present usually do not exceed ½ length of the central lobe; petioles 2–20 mm long; pedicels 3–23 mm long; corolla 8–21 mm long; sepals 3.5–6.5 mm; seeds 2.9–4 mm long, brown, with wavy, ± anastomosing ridges and ± continuous narrow wings (Figure 2E)..... **C. angustissimus**[1]

6: Leaves up to 25 mm, though most less than 15 mm, central lobe margin often coarsely crenate, shallow to deeply lobed, ascending secondary lobes when present more than ½ length of the central lobe; petioles 2–10(–12) mm; pedicels 2–6 mm long; corolla 5–7 mm long; sepals 3–4 mm; seeds 2.5–3.5 mm long, brown to dark brown, with fine dense anastomosing ridges and a discontinuous wing (Figure 2F)..... **C. recurvatus** subsp. **nullarborensis**

5: Fruiting pedicel not recurved

7. Leaves of the same plant often strongly dimorphic, leaf margin coarsely crenate, laciniate to deeply lobed, ascending secondary lobes often exceed ½ length of central lobes; sepals 3.5–5.5 mm with mostly spreading or ascending hairs; corolla 6–9(–10) mm long; seeds 2.5–3.5 mm long, chubby, less 1.5 long as wide, with ridges and tubercles of unevenly distributed tufts of dense partly fused hair-like structures (Figure 2G) ..... **C. clementii**

7: Leaves generally not strongly dimorphic, central lobe margin mostly entire, when present ascending secondary lobes rarely exceed ⅓of the central lobe length; sepals 4–7 mm with mostly appressed hairs, rarely spreading; corolla 8–18 mm long; seeds 3–4.8 mm long, elongated, more 1.5 long as wide, with a fine to nearly smooth pattern of low irregular tubercles and ridges (rarely with spongy outgrowth towards outer margins) (Figure 2D)..... **C. remotus**

[1]*Convolvulus angustissimus* R.Br. is very poorly known in Western Australia. Only five of the ten specimens currently lodged at PERTH have been determined by a specialist, the late R.W. Johnson. Moreover, three of these, including the most recent collection from 1982 (*G.J. Keighery* 5655), are tentative identifications of poor-quality specimens as indicated by the use of question marks on his determinavit slips. The status of the species in Western Australia is therefore somewhat problematic and in need of clarification. The distinguishing features used in the key above for *C. angustissimus* were mostly based on Johnson's descriptions (2001) of this species.

Acknowledgements

We would like to thank the following people who helped in various ways with this project: Steve Dillon for assistance with scanning electron microscopy; Emma Adams for sharing her local knowledge and her efforts in seeking new populations; Karina Knight for helping with assessing the pollen morphology; Skye Coffey with assisting in taking macro photos; Kelly Shepherd and John Wood for their valuable constructive comments on the manuscript and Kevin Thiele for taxonomic advice. We would especially like to acknowledge the contribution of horticulturalist and naturalist, William Archer. William is the discoverer of numerous new plant species from the Esperance area, and he alerted the second author to the likelihood that the short-lived plant that he had been observing in the aftermath of recent fire was another undescribed species.

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