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Eilifdahlia schwarzii (Caloplacoideae, Teloschistaceae) − a new species from Western Australia

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The new species *Eilifdahlia schwarzii* F. Schumm & S. Y. Kondr. is described. It differs from the more common southern Australian *E. dahlii* (Elix, S. Y. Kondr. & Kärnefelt) S. Y. Kondr., Kärnefelt, Elix, A. Thell, J. Kim, A. S. Kondr. & J.-S. Hur in having a poorly developed whitish thallus, bright yellow to bright yellow-orange apothecia, with a persistent glossy margin, a proper exciple with scleroplectenchymatous tissue, longer ascospores, and wider ascospore septa. The new species is known from scattered localities in Western Australia. The new combination *E. sergeyana* (Kantvilas) S. Y. Kondr., Elix, Kärnefelt & A. Thell is made, and a key to the species of *Eilifdahlia* is presented.

Key words: New species, new combination, ecology, lichen substance, key

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Introduction

The genus *Eilifdahlia* comprises four species, *E. dahlii, E. sergeyana, E. schwarzii* and *E. wirthii.* Two of these species, the type of the genus *E. dahlii* as well as *E. wirthii* have been included in phylogenetic analyses which confirmed that *Eilifdahlia* was close to *Franwilsia* (Kondratyuk *et al.* 2014). The other two species will be investigated in the near future (Kondratyuk *et al.* in prep.).

Eilifdahlia S. Y. Kondr., Kärnefelt, Elix, A. Thell & J.-S. Hur occurs primarily in the Southern Hemisphere and was first described in 2014. The genus parallels *Blastenia* A. Massal., primarily distributed in the Northern Hemisphere. In the original description of *Eilifdahlia* two species were included, namely *E. dahlii* (Elix, S. Y.Kondr. & Kärnefelt) S. Y. Kondr., Kärnefelt,

Elix, A. Thell, J. Kim, A. S. Kondr. & J.-S. Hur, which is widely distributed in southern Australia, and *E. wirthii* S. Y. Kondr., known from several localities in South Africa (Kondratyuk *et al.* 2014).

The genus *Eilifdahlia* was supported by a three gene phylogeny based on separate and combined analyses of ITS1/ITS2 nrDNA, 28S nrLSU and 12S mtSSU sequences (Kondratyuk *et al.* 2014). The genus is most similar to *Franwilsia* S. Y. Kondr., Kärnefelt, Elix, A. Thell & J.-S. Hur, and in the combined analysis they formed a subclade within the subfamily Caloplacoideae (Kondratyuk *et al.* 2014). In addition to chemical differences, the *Franwilsia* is distinguished in having a hymenium inspersed with oil droplets.

Another species, *Caloplaca sergeyana* Kantvilas, recently described from siliceous rocks in South Australia, is similar to *E. dahlii* (Kantvilas 2016). Here it is combined into *Eilifdahlia*. During a revision of lichen collections from Western Australia by the second author (FS) an additional species was discovered, which forms the subject of this paper. A key to the four species of *Eilifdahlia* is presented.

Material and Methods

A total of more than 100 specimens collected during last decade and deposited in B and HO, as well as some duplicates in the Korean Lichen Research Institute, Sunchon National University, South Korea (KoLRI), the Hungarian Natural History Museum (BP) and the Lichen Herbarium in the M. H. Kholodny Institute of Botany of National Academy of Sciences of Ukraine (KW-L), have been examined using standard microscopical techniques and hand-sectioned under a dissecting microscope (Nikon SMZ 645). Anatomical characters were observed using a Nikon Eclipse E200 microscope and a Zeiss Scope, complemented with a digital camera AxioCam ERc 5s, as well as in Wangen using Wild M3 and Olympus BX51 DIK microscopes and Canon Eos 600D with Canon MP-E 65 mm Macro Photo and Kryostat Microm HM 560. Sections of apothecia were tested with water, K and IKI (10% potassium iodide).

The New Species

Eilifdahlia schwarzii F. Schumm & S. Y. Kondr. **sp. nov.**

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Similar to *E. dahlii* but differs in having a poorly developed, whitish thallus, bright yellow to yellow-orange apothecia, with a persistent, glossy proper margin, a proper exciple of scleroplectenchymatous tissue, longer ascospores and wider ascospore septa.

Type: Australia. Western Australia, Yalgorup National Park, Lake Clifton, 32º44’43”S 115º39’20.9”E, 15 m alt., on bark, growing together with *Buellia dissa* (Stirt.) Zahlbr. and species of *Physcia*, *Opegrapha*, *Candelariella* and *Arthonia*, 28.x.2009, *F. Schumm & E. Stocker-Wörgötter* (PERTH, ex herb. F. Schumm 15956 − holotype); the same locality, growing together with *Physcia* sp., *Buellia dissa* and *Kaernefia kaernefeltii* (S. Y. Kondr., Elix & A. Thell) S. Y. Kondr. *et al.* (B ex herb. F. Schumm 15937 − isotype); the same locality, growing together with *Buellia* sp. and *Opegrapha* sp. (B ex herb. F. Schumm 15951 − isotype).

Thallus corticolous, up to 3 cm wide or forming aggregations, very thin, continuous to finely granular or warty, white to dirty white or whitish-grey, covered with numerous bright yellow or yellow-orange apothecia with a glossy, well developed, pure yellow proper margin and sparse to numerous, dull orange to bluish-orange or bluish-black conidiomata.

Apothecia 0.5−1.3 mm diam., numerous, dispersed, biatorine (without algae), initially regularly rounded but becoming undulate at the margin. The proper margin distinct, persistent, 0.08−0.14(−0.15) mm wide, raised above the disc, usually somewhat shiny, bright yellow to dull yellow-brown or dull yellow-orange (somewhat paler than the disc). In section 0.2−0.25(−0.35) mm thick, biatorine, proper exciple (40−)50−70 µm thick in the uppermost lateral portion, 80−90 µm thick in the lower lateral and basal portions, palisade plectenchymatous in the outer basal portion, the inner portions scleroplectenchymatous with lumina to 1−1.5 µm diam., the outermost part of the lateral portion to 30 µm thick, brownish-orange, the inner portion hyaline; hymenium 60−70 µm high; epihymenium dark brownish-orange in contrast to the pale yellow-brown outer layer of the proper exciple; paraphyses slightly broader at apices, to 3.5 µm wide in K; subhymenium 50−60(−70) µm thick, dull yellow to dull brownish-yellow in lower portion; ascospores rather long and with long septa, (13−)16−20.5(−22) × 7−11(−12) µm in water and (15−)16−21(−22) × (7−)9−12(−14) µm in K, septa (4−)7−9 µm wide in water and (8−)9−12(−14) µm wide in K. Conidiomata dull orange, bluish-orange or blackish-orange, to 0.05−0.07 mm diam.; conidia narrow bacilliform, 2.5−3.5 × 0.7−0.8 µm.

Chemistry: Thallus UV+ yellow, parietin and lichexanthone only present in the apothecia.

Ecology: *Eilifdahlia schwarzii* grows on the bark of various trees, together with *Kaernefia kaernefeltii, Buellia dissa* and species of *Arthonia, Candelariella, Opegrapha* and *Physcia*. It sometimes overgrows thalli and even ascomata of other crustose lichens [*e.g.* specimens 15951 and 15912 where *E. schwarzii* grows over ascomata of *Opegrapha* sp.].

Etymology: The new species is named in honour of the German bryologist Uwe Schwarz (17.V.1965−) a friend, colleague and keen field-trip supporter of the second author.

Distribution: *Eilifdahlia schwarzii* is only known from several localities in Western Australia.

Taxonomic notes: *Eilifdahlia schwarzii* is similar to two other Australian species, the common, corticolous *E. dahlii* and the rare, epilithic *E. sergeyana*; neither species have inspersed hymenia. Both *E. schwarzii* and *E. dahlii* have a brownish-yellow lower subhymenium, but *E. schwarzii* differs in having a membranous thallus in contrast to the thick, well developed, continuous and ± wrinkled thallus of *E. dahlii*. The thallus of *E. schwarzii* varies from white to dirty white or whitish-grey whereas *E. dahlii,* varies from yellow-grey to brownish-grey. Furthermore, *E. schwarzii* has bright yellow to yellow-orange apothecia, whereas the discs are brownish-orange to dark brown in *E. dahlii* (Table 1). The proper margin of the apothecia is persistent and glossy in *E. schwarzii* but becomes excluded in *E. dahlii*. *E. schwarzii* is also characterized by a scleroplectenchymatous proper exciple rather than pseudoprosoplectenchymatous as in *E. dahlii* (Kondratyuk & Kärnefelt 1997). The ascopores are longer with wider septa in *E. schwarzii*, the hymenium is lower and the conidia narrower (Table 1). Finally, the two species differ chemically, since *E. schwarzii* lacks lichexanthone in the thallus, whereas this substance is abundant in *E. dahlii*.

The epilithic *E. sergeyana* lacks lichexanthone in the thallus, but differs in having a very thin, more or less continuous thallus, smaller apothecia and shorter ascospores with narrower septa (Kantvilas 2016).

The epiphytic *E. wirthii* is distinguished from *E. schwarzii* by its thicker thallus, smaller, darker and pruinose discs, 0.2−0.8 mm diam., a bluish black proper exciple, an entirely brownish subhymenium, smaller ascospores, (8−)9−11 × 4−5(−8) µm, with narrower septa, (1−)3−4 µm wide, and slightly broader conidia, 3−3.5 × 0.7−1.2 µm (Kondratyuk *et al.* 2014).

In some respects *E. schwarzii* resembles *Franwilsia kilcundaensis* (S. Y. Kondr. & Kärnefelt) S. Y. Kondr. *et al.*, which is characterized by its brownish-grey thallus containing lichexanthone, but this species differs from *E. schwarzii* by having rusty orange-brown discs with a pale grey thalline margin, and a densely oil-inspersed hymenium and subhymenium (Kondratyuk *et al.* 2009b, Kantvilas 2016).

Additional specimen examined: Australia: Western Australia, Two Peoples Bay east of Albany, 34º58'10.8"S 118º10'44.4"E, 6 m alt., on bark, growing together with species of *Opegrapha* and *Megalospora*, 27.x.2009 F. Schumm & E. Stocker-Wörgötter (B, ex herb. F. Schumm 15912 – paratype).

Figure 1. *Eilifdahlia schwarzii* (HOLOTYPE), general habit. Photo: Felix Schumm.

New combination

Eilifdahlia sergeyana (Kantvilas) S. Y. Kondr., Elix, Kärnefelt & A. Thell, **comb. nov.**

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Basionym: *Caloplaca sergeyana* Kantvilas, Journal of the Adelaide Botanic Gardens 29: 57 (2016).

Table 1. A comparison of *E. schwarzii* and related species.

Character	*Eilifdahlia schwarzii*	*Eilifdahlia dahlii*	*Eilifdahlia sergeyana*
Thallus development	Poorly developed	Distinct	Thin but distinct
Thallus colour	Whitish	Yellow-grey to brownish grey or grey-green	Greenish grey to brownish grey
Apothecial colour, disc	Yellow-orange	Dull brownish orange to dark brown	Orange to yellow-orange
Apothecial width, mm	0.5–1.3	0.4–0.9(–2.5)	0.5–0.8(–1)
Apothecial proper margin	Persistent and glossy	Indistinct and excluded, dull	Initially inrolled, with age slightly flexuose, persistent
Tissue of true exciple	Scleroplectenchymatous	Pseudoprosoplectenchymatous	Of radiating, parallel, anastomosing hyphae
Ascospore form and size, µm	Oblong, (13–)16–20.5(–22) × 7–11(–12)	Subspherical, (12–)13–16(–19 × (6–)7–9(–10) after Kondratyuk *et al.* (2009a; 12–17 × 5–9 according to Kantvilas (2016)	Oblong, (11–)11.5–16(–17) × (5–)6–8(–8.5)
Ascospore septum µm	(4–)7–9	(4–)6–7(–9)	3–7(–9)
Hymenium height, µm	60–70	80–90	70–80
Conidia width, µm	0.8–0.9	0.9–1.0	unknown
Lichexanthone	Present in apothecia; absent in thallus	Abundant in both apothecia and thallus	Absent in both apothecia and thallus
Distribution	Scattered in Western Australia	Widespread in southern Australia	Known only from type collection in South Australia

Key to the species of *Eilifdahlia*

1 On rock ..... ***E. sergeyana***
– On bark of trees or on lignum 2
2. Disc dark yellow-brown to blackish brown with yellowish pruina; proper margin dark brown or reddish brown; ascospores 8−12 × 4−5 µm ..... ***E. wirthii***
– Disc dull orange or brownish orange, epruinose; proper margin bright yellow to dull yellow-orange; ascospores 13−21 × 5−11 µm..... 3
3 Ascospores 12−16 µm long; septum to 6 µm wide; proper margin initially present, then excluded..... ***E. dahlii***
− Ascospores 16−21 µm long; septum 7−12 µm wide; proper margin persistent..... ..... ***E. schwarzii***

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