



## SIPHULA <sup>1</sup>

Gintaras Kantvilas <sup>2</sup>

*Siphula* Fr., *Lichenogr. Eur. Reform.* 7: 406 (1831).

Type: *S. ceratites* (Wahlenb.) Fr.

Thallus fruticose, foliose or, rarely, squamulose, consisting of highly variable lobes that form tufts or extensive swards or mats; lobes flattened or occasionally subterete, mostly chalky white, sometimes with faint greyish, bluish or beige hues, corticate, typically isobilateral, anchored to the substratum by basal tufts of highly branched, root-like, pale brown rhizines 0.5–1.5 mm thick at the point of attachment. Photobiont a unicellular green alga with globose cells 5–10 µm diam. Ascomata and conidiomata unknown. Chemistry: principally depsides, especially baeomycesic, squamatic, thamnolic or hypothamnolic acids; the type species contains the chromone siphulin.

A genus of c. 25 species, with one species, *S. ceratites*, with a circumboreal distribution and the remainder found mainly in southern Africa, Australasia, southern South America, Hawaii and the Neotropics. Representatives of these essentially Southern Hemisphere taxa also occur in East Africa, Sri Lanka, East Asia, the Mascarene Islands and montane areas of New Guinea and the Solomon Islands. Most species are found on soil, especially peat, or on thin soil over rocks; a few are epiphytic. The genus is usually easily recognised in the field, although the basal squamules of some species of *Cladonia* can be superficially similar; however, these lack rhizines and tend to be dorsiventral, with a greenish upper and whitish lower surface.

*Siphula* is notoriously morphologically variable, posing a challenging task for defining species. Chemical composition has proved to be the most useful character in that chemotypes are discrete and unambiguous, and recent taxonomic treatments have been based principally on thallus chemistry and secondarily on morphology. The extent to which this taxonomic framework is supported genetically remains to be tested. The absence of fruiting bodies had, in the past, posed difficulties with the higher classification of *Siphula*, but the advent of molecular methods revealed that its relationships lay in the family Icmadophilaceae (Platt & Spatafora 2000), together with genera such as *Dibaeis*, *Knightiella*, *Knightiellastrum*, *Siphulella*, *Thamnolia* and several others that do not occur in Tasmania. Chemical and morphological studies (Kantvilas 2002) suggested that several infrageneric groups could be perceived in *Siphula* and, following further molecular studies, Grube & Kantvilas (2006) transferred a number of species to a separate genus, *Parasiphula*, in the family Coccotremataceae. In the Southern Hemisphere, *Siphula* is represented exclusively by depside-containing species, and more recent molecular studies (Ludwig *et al.* 2016) have suggested that these may also deserve separate generic status. However, this issue cannot be resolved until species from the Neotropics, which contain both chromones and depsides, have been included in analyses.

*Siphula* is a rich host for lichenicolous fungi (Motiejūnaitė *et al.* 2019) and, in the past, the fruiting bodies of these parasites have, on occasion, been misinterpreted as the fruiting bodies of *Siphula* itself. For example, early reports of ascomata from *S. decumbens* proved to be the fungus *Cercidospora santessonii* Motiej. *et al.*, whereas the more recent report of “fertile” *Siphula* by Ludwig *et al.* (2016) proved to be based on the gall-like, aggregated fruiting bodies of the parasite *Aabaarnia siphulicola* Diederich.

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Key references: Platt & Spatafora (2000); Kantvilas (1998, 2002); Grube & Kantvilas (2006); Ludwig *et al.* (2016); Motiejūnaitė *et al.* (2019).

1	Thallus containing hypothamnolic acid; medulla K+ purple, P-	2 <i>S. dissoluta</i>
	Thallus containing thamnolic acid (medulla K+ yellow, P+ yellow-orange) or baeomycesic and squamatic acids (medulla K- or + pale yellow, P+ pale yellow)	2
2(1)	Thallus containing baeomycesic and squamatic acids (medulla K- or + pale yellow, P+ pale yellow, UV+ yellowish or white)	3 <i>S. fastigiata</i>
	Thallus containing thamnolic acid (medulla K+ yellow, P+ yellow-orange, UV-)	3
3(2)	Lobes broadly flattened, 10–20(–45) mm tall and 1–5(–15) mm wide, erect, ascending or decumbent, frequently lacerate and fenestrate	1 <i>S. decumbens</i>
	Lobes elongate, to 70 mm long and to 1.5 mm wide, pendulous or erect, entire	4 <i>S. gracilis</i>

### 1 *Siphula decumbens* Nyl.

*Lich. Nov. Zel.*: 14 (1888).

Thallus fruticose, forming discrete tufts or, more commonly, extensive swards or mats. Lobes very variable, generally broadly flattened, plane, undulate or curved, erect, ascending or decumbent, densely crowded to loosely entangled, occasionally with a thickened 'midrib' c. 0.5–1 mm wide, typically broadening from a narrow base and dividing irregularly and unevenly in several planes, mostly 10–20(–45) mm tall, 0.25–0.4 mm thick, 1–5(–15) mm wide in the widest (central) parts; surface chalky white to pale cream, at times tinged very pale beige or bluish, scabrid, dimpled and areolate, often becoming furrowed, split and fenestrate in shaded habitats, at times markedly more mealy and scabrid on the undersurface and lobes appearing "dors-iventral"; apices generally rounded and entire, sometimes thickened or crenulate, lobulate and nodulose, or rather ragged and abraded; margins entire, crenulate or ragged and lacerate, not markedly thickened.

Chemistry: thamnolic acid (major); cortex and medulla K+ bright yellow, often slowly turning brownish red, KC-, C-, P+ yellow-orange, UV-.

A highly variable species, characterised by the chalky white, usually broadly flattened, scabrid lobes containing thamnolic acid. It can form extensive, dense mats of short, squat, decumbent lobes binding banks of peat in moorland, swards of ascending lobes beneath light scrub, or tufts of fenestrate, ragged lobes that grow epiphytically on mossy rainforest trees. This species is the most widespread and common member of the genus globally, occurring also in New Zealand, South-East Asia, New Guinea, East Asia, southern Africa, and the entire latitudinal range of South America (but, surprisingly, it is not known from the Australian mainland). In Tasmania, it ranges from coastal to alpine elevations. Although most common in wet moorlands and heathlands of the west and interior, it also has a scattered distribution in the drier, eastern parts of Tasmania, especially in regions of granite or sandstone.

Ballroom Forest Track, 41°40'S 145°57'E, 1000 m, 1969, G.C. Bratt 72/1210 (HO); Hungry Flats, 42°31'S 147°29'E, 560 m, 2000, G. Kantvilas 359/00 (HO); Red Knoll, 43°02'S 146°17'E, 450 m, 2004, G. Kantvilas 192/04 (GZU, HO).

### 2 *Siphula dissoluta* Nyl.

*Lich. Nov. Zel.*: 14 (1888).

Thallus fruticose, forming mats or tufts on soil. Lobes elongate, erect or ascending, typically flattened and strap-shaped, undulate, twisted and rather densely entangled, 5–15 mm tall, 1–3 mm wide, 0.25–0.4 mm thick, simple or sparsely and irregularly branched; surface pale whitish grey, sometimes with a very faint bluish grey hue towards the apices, unevenly scrobiculate, dimpled, puckered or verrucose throughout, areolate, in part scabrid, occasionally shallowly furrowed; apices generally rounded but very unevenly notched or crenulate, sometimes a little thickened, brittle; margins undulate, entire or irregularly notched, not markedly thickened.

Chemistry: hypothamnolic and decarboxythamnolic acids; cortex K- or very weakly purple, C-, KC-P-, UV-; medulla K+ purple, KC-, C-, P-, UV+ vivid white.

Characterised by the presence of hypothamnolic acid, and also known from New Zealand, New Guinea, southern South America and Central America. Across its global range, this species is as morphologically variable as *S. decumbens*. However, in Tasmania, all specimens consist of relatively short, gnarled lobes, grow on soil in alpine heathland and, without chemical analysis, are indistinguishable from *S. decumbens* and *S. fastigiata* when growing in the same habitats. It is uncommon and known mainly from the southern, dolerite peaks.

Mt Hartz, 43°15'S 146°46'E, 1290 m, 1966, G.C. Bratt 3078 & F. Lakin (HO); Mt Sarah Jane, 42°59'S 146°27'E, 1290 m, 2000, G. Kantvilas 455/00 (GZU, HO); Adamsons Peak, 43°21'S 146°49'E, 1225 m, 2001, G. Kantvilas 15/01 (GZU, HO).

### 3 *Siphula fastigiata* (Nyl.) Nyl.

*Ann. Sci. Nat. Bot.*, sér. 4, 19: 297 (1863); —*Siphula torulosa* var. *fastigiata* Nyl., *Syn. Meth. Lich.* 1: 263 (1860).

*Siphula mooreae* Zahlbr., *Akad. Wiss. Wien. Math.-Naturwiss. Kl. Denkschr.* 104: 365 (1941).

Thallus fruticose, forming mats or tufts on soil. Lobes very variable, broadly flattened, plane or, more commonly, undulate, curved and/or twisted in several planes, usually erect or ascending, or decumbent and contorted, crowded to rather dispersed, typically broadening from a narrow base and then sparsely branched, (5–)10–35 mm tall, 0.5–4 mm wide, 0.15–0.4 mm thick; surface vivid chalky white to very pale olive-grey, smooth to wrinkled and dimpled, or scabrid and areolate; apices rounded and entire, or crenulate, often abraded or lobulate, commonly a little thickened; margins smooth and entire, or undulate to crenate, not markedly thickened.

Chemistry: baeomycesic and squamatic acids; cortex K± pale yellow, KC–, C–, P+ pale yellow, UV+ pale yellowish white; medulla K– or K± pale yellow, KC–, C–, P+ pale yellow, UV+ white. The two substances tend to be unevenly distributed in the thallus, with baeomycesic acid mainly in the outer parts, and squamatic acid mainly in the medulla. The variable reactions in K and UV are especially evident in scabrid thalli where the medullary tissues containing squamatic acid occur at the thallus surface.

This is a very variable species that falls entirely within the morphological range of *S. decumbens*, to the extent that chemical analysis is essential for its identification. At several locations, both species occur together. The chemical difference between the two taxa is mirrored in *Thamnolia vermicularis*, and it has been suggested that they should be considered merely chemical races, an hypothesis yet to be tested fully. *Siphula fastigiata* is based on a type specimen from the Neotropics, and it also remains to be seen whether populations from Australasia, southern South America and tropical America are conspecific. Whilst its geographical range in Tasmania overlaps with that of *S. decumbens*, it is generally less common and more “eastern” in distribution, with most collections being from the Central Plateau, Mt Wellington or the pinnacles of the east and north-east. It is found on gritty or silty soil, mostly in alpine heathland. Unlike *S. decumbens*, it is rare in buttongrass moorland (the stronghold for that species) and is never lignicolous or epiphytic.

Devils Gullet, 1148 m, 1971, G.C. Bratt & J.A. Cashin 71/1564 (HO); Sleepy Bay Road, 42°08'S 148°18'E, 20 m, 1984, P. James & G. Kantvilas 156/84 (BM, HO); Mt Bobs, 43°18'S 146°36'E, 1080 m, 1987, J. Jarman (HO).

### 4 *Siphula gracilis* Kantvilas

*Herzogia* 13: 133 (1998). Type: Tasmania, Green Head, c. 3 km SSE of Greystone Bluff, 43°06'S 146°04'E, epiphytic in rainforest, 750 m, 8 March 1991, G. Kantvilas 49/91 (holo—HO!).

Thallus fruticose, typically forming pendulous tufts with ascending apices amongst bryophytes on bark or wood or, more rarely, growing ± erect on peaty soil. Lobes slender and elongate, discrete, loosely entangled or rather crowded, flattened to ± subterete, ± evenly tapered, sometimes somewhat twisted, 0.2–1.5(–2) mm wide, (15–)30–70 mm long, 0.2–0.5 mm thick, simple or sparsely branched; surface chalky whitish grey to cream-white, smooth to undulate or scrobiculate, frequently areolate and scabrid, sometimes becoming ± lumpy and mealy; apices blunt; margins entire, neither thickened or notched.

Chemistry: thamnolic acid (major); cortex and medulla K+ bright yellow turning brownish red, KC-, C-, P+ yellow-orange, UV-.

Common and widespread in western Tasmania in thamnolic and implicate rainforest and in wet scrub; also known from New Zealand. In its typical form, this species is an epiphyte, characterised by the chalky white, slender, pendulous lobes with ascending apices, and the presence of thamnolic acid. In such situations, it is easily distinguished from *S. decumbens* with which it grows, and which differs by its relatively short, broad, tufted, lacerate-fenestrated lobes. On soil, the lobes of *S. gracilis* tend to be shorter and erect, and then separation from *S. decumbens* can be problematic.

Cradle Mountain NP, above Waldheim, 1968, W.A. Weber & D. McVean L-49703 (COLO, HO); Mt Dundas Track, 41°55'S 145°28'E, 730 m, 1988, G. Kantvilas 547/88 (HO); Crest Range, 43°17'28"S 146°30'26"E, 980 m, 2016, G. Kantvilas 220/16 (HO).

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