

## The lichen genus *Topeliopsis*, additions and corrections

Andreas FRISCH and Klaus KALB

**Abstract:** *Topeliopsis darlingtonii* A. Frisch & Kalb and *Topeliopsis elixii* A. Frisch & Kalb from Australia and *Topeliopsis meridensis* Kalb & A. Frisch from Venezuela are described as new species. *Thelotrema decorticans* Müll. Arg. and *Ocellularia subdenticulata* Zahlbr. are transferred to *Topeliopsis* and are the correct names for *T. corticola* Kalb and *T. vezdae* Kalb, respectively. A revised key of the genus *Topeliopsis* is presented. Ascoconidia, produced in old ascospores of *T. elixii*, are described for the first time for the *Thelotremataceae*.

**Key words:** ascoconidia, Australia, *Graphidaceae*, lichenized ascomycetes, *Thelotremataceae*, *Topeliopsis*, Venezuela.

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### Introduction

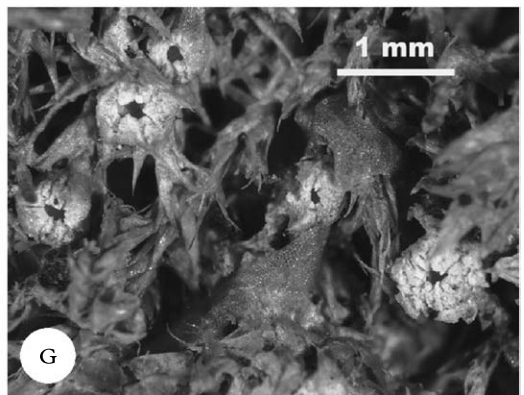
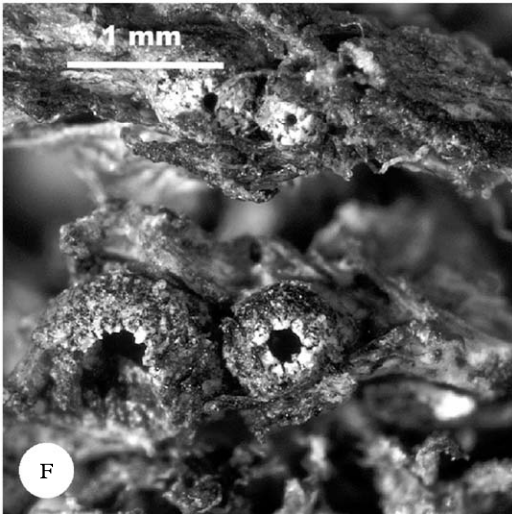
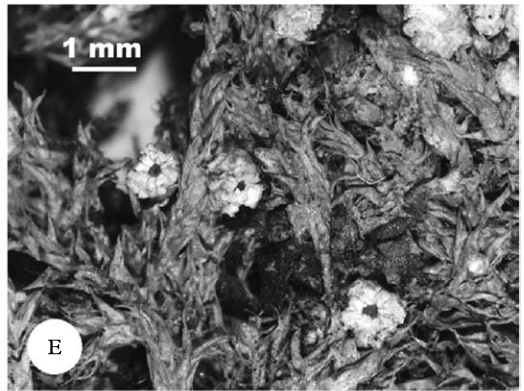
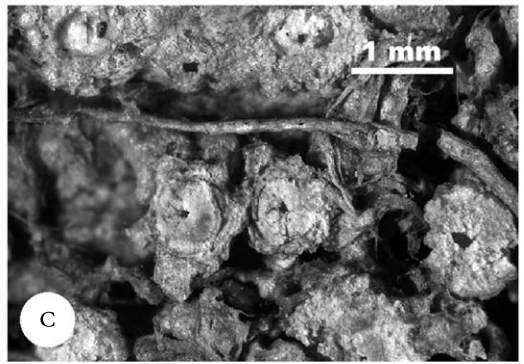
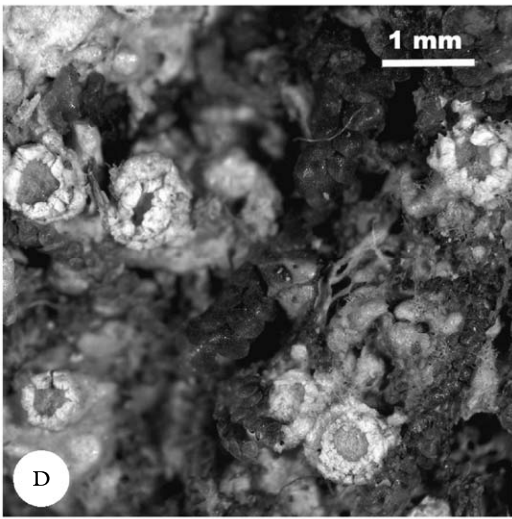
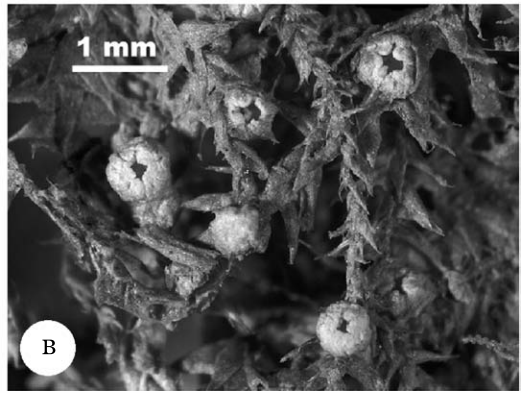
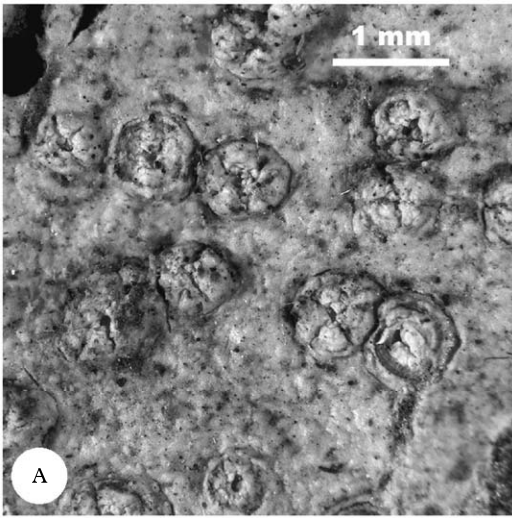
The lichen genus *Topeliopsis* was described by Kantvilas & Vězda (2000) for three species of *Thelotremataceae* with adnate urceolate apothecia, a fused proper exciple with prominent periphysoids, and large hyaline, muriform, thin-walled ascospores turning reddish or purple in iodine. In this circumscription, *Topeliopsis* was noted by the authors to be rather heterogeneous and, in consequence, two of the species were removed from the genus (Kalb 2001). This author accepted only the generic type, *Topeliopsis muscigena* (Stiz.) Kalb (syn. *T. muscicola* Kantvilas & Vězda), but described three new species from Australia, namely *Topeliopsis acutispora*, *T. corticola* and *T. vezdae*. Also, the concept of *Topeliopsis* was emended to accommodate species with thick-walled ascospores, since it could be demonstrated that the ascospores of *Topeliopsis muscigena* are not thin-walled as described in the protologue, but belong to the thick-walled type prevalent in the *Thelotremataceae*. This is apparent in the

slight thickening of the endospore, which in this species is always recognizable at the edges of the locules. Furthermore, the colour of the ascospore walls in iodine confirms the thick-walled type, as the amyloidity of the 'graphidean'-type ascospores of the *Thelotremataceae* is always located in the endospore. Current knowledge suggests that all species of *Thelotremataceae* with truly thin-walled ascospores lack any amyloid coloration (A. Frisch unpublished). Marked reduction of the endospore, as is observed for *Topeliopsis muscigena* and the two newly described species *Topeliopsis elixii* and *T. meridensis*, is a common phenomenon in densely muriform ascospores of the *Thelotremataceae*. This is largely an effect of the intensity of the cell division and the number of locules, and cannot be given taxonomic importance at genus level. Consequently, species with a markedly thickened endospore, all with transversely septate or submuriform ascospores, were accepted for the genus as they agree well with the type species in apothecium and thallus structure, as well as in ecology and distribution.

During the investigation of type material for a revision of the African *Thelotremataceae* (A. Frisch unpublished), we discovered two names belonging to *Topeliopsis* as recently circumscribed, namely *Thelotrema decorticans*

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A. Frisch: Institut für Botanik, Universität Regensburg, Universitätsstraße 31, D-93040 Regensburg, Germany.  
K. Kalb (corresponding author): Lichenologisches Institut Neumarkt, Im Tal 12, D-92318 Neumarkt, Germany.



Müll. Arg. and *Ocellularia subdenticulata* Zahlbr. These two species proved to be conspecific with *Topeliopsis corticola* Kalb and *T. vezdae* Kalb, respectively. In addition,

two new species were discovered recently in Australia and another in Venezuela. In this paper, we describe the new species and make the necessary new combinations.

**Revised key to the species of the lichen genus *Topeliopsis***

- 1 Ascospores transversely septate . . . . . 2  
Ascospores muriform . . . . . 4
- 2(1) Stictic acid present; ascospores 13–15-septate, 41–52 × 9–10 µm, with subacute ends . . . . . **Topeliopsis darlingtonii A. Frisch & Kalb**  
Thallus lacking secondary chemical compounds . . . . . 3
- 3(2) Ascospores 25–35-septate, 90–130 × 8–12 µm, ends acute to subacute . . . . .  
. . . . . **Topeliopsis acutispora Kalb**  
Ascospores 14–24-septate, 55–100 × 10–16 µm, ends rounded . . . . .  
. . . . . **Topeliopsis subdenticulata (Zahlbr.) A. Frisch & Kalb**
- 4(1) Ascospores 8/ascus, 50–60 × 13–18 µm . . . . .  
. . . . . **Topeliopsis decorticans (Müll. Arg.) A. Frisch & Kalb**  
Ascospores 1/ascus . . . . . 5
- 5(4) Hymenium inspersed with minute spherical drops; excipulum brownish . . . . .  
. . . . . **Topeliopsis meridensis Kalb & A. Frisch**  
Hymenium not inspersed; excipulum hyaline . . . . . 6
- 6(5) Hypostictic acid present; disc flat, white pruinose . . . . .  
. . . . . **Topeliopsis elixii A. Frisch & Kalb**  
Thallus compounds lacking; disc bowl-shaped, epruinose . . . . .  
. . . . . **Topeliopsis muscigena (Stiz.) Kalb**

**The New Species**

***Topeliopsis darlingtonii* A. Frisch & Kalb sp. nov.**

Similis *Topeliopsis subdenticulatae*, sed thallo acidum sticticum continente et apotheciis minus elevatis differt.

Typus: Australia, Queensland, Darlington Range, c. 15 km SSW of Canungra, in a cool temperate submontane rainforest, 28° 13' 32" S, 153° 07' 42" E, 980 m alt., 16 August 2002, K. Kalb 33979 (CANB—holotypus; hb. Kalb, hb. Frisch—isotypi).

(Figs 1A, 2 & 5A)

*Thallus* corticolous on soft bark, dirty grey to olive-grey, thin (c. 0.03–0.07 mm), with a smooth to slightly uneven, compact and glossy surface. *Prothallus* line thin, brownish.

*Phenocortex* (Büdel & Scheidegger 1996) 3–6 µm thick, without internal splitting, formed of strongly conglutinated periclinal hyphae. *Photobiont layer* 20–40 µm thick, without oxalate crystals. *Medulla* indistinct to absent.

*Apothecia* frequent, dispersed, moderately emergent, 0.5–0.8 mm diam., with a thick layered, incurved to rim-like, white to pale brown margin and a moderately wide, fissured pore. *Hymenium* pale brown, covered by a thin white, finely granular pruina. *Phenocortex* 3–6 µm thick. *Photobiont layer* 10–30 µm thick. *Proper exciple* cupular, hyaline, a strongly conglutinated prosoplectenchyma, 12–20 µm deep at

FIG. 1. *Topeliopsis* species. A, *T. darlingtonii* (holotype); B, *T. acutispora* (isotype, hb. Kalb); C, *T. decorticans* (holotype); D, *T. elixii* (holotype); E, *T. muscigena* (McOwan s.n. isotype PRE); F, *T. meridensis* (holotype); G, *T. subdenticulata* (Kalb 20481, hb. Kalb). Scales: A–G=1 mm.

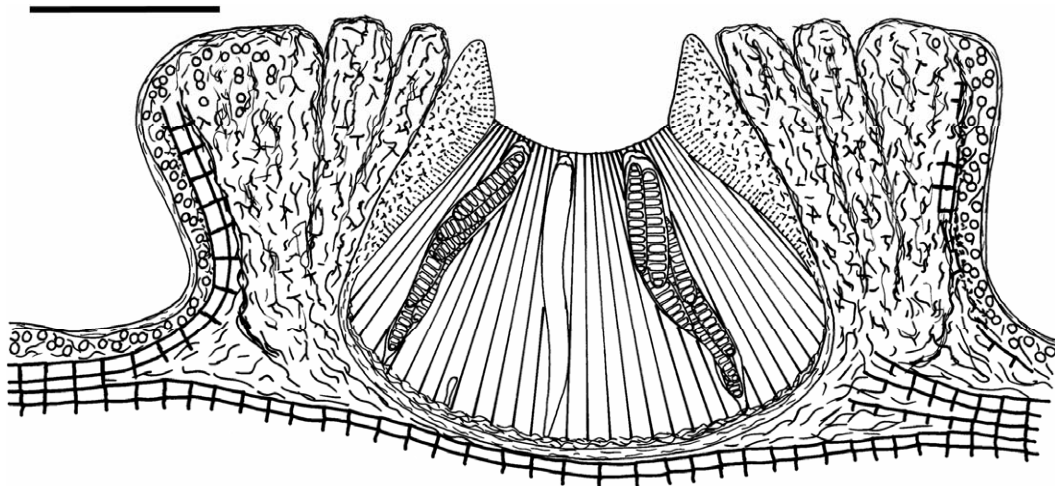


FIG. 2. *Topeliopsis darlingtonii* (holotype), section of thallus and apothecium. Scale=100  $\mu$ m.

the base, split into up to three separate, 25–35  $\mu$ m wide strands at the sides. *Periderm layer* present or absent, c. 25  $\mu$ m wide, not conglutinated, formed of distinct rows of periderm cells. *Periphysoids* prominent, running down to the base of the proper exciple, perpendicular, up to 25  $\mu$ m long and 2–2.5  $\mu$ m wide, with 2–5 rectangular cells. *Subhymenium* 10–12  $\mu$ m high. *Hymenium* 130–150  $\mu$ m high, clear. *Paraphyses* simple, dense, 1.5–2  $\mu$ m wide, not thickened at the apex. *Epithymenium* colourless, 7–10  $\mu$ m high. *Asci* broadly clavate, c. 120–140  $\times$  15–22  $\mu$ m, with well-developed tholus when mature. *Ascospores* 8/ascus, hyaline, transversely 13–15-septate, 41–52  $\times$  9–10  $\mu$ m, with subacute ends, halonate in young stages, I+ pale purplish blue, spore development macrocephalic.

*Pycnidia* not seen.

*Chemistry.* Stictic acid (major), constictic acid (minor),  $\alpha$ -acetylconstictic acid (minor) and consalazinic acid (minor) detected by TLC.

*Etymology.* The specific epithet refers to the type locality in the Darlington Range, Queensland.

*Remarks.* The layered margin of the apothecia of *Topeliopsis darlingtonii* is

reminiscent of some species of the *Thelotrema subtile*-group. However, the new species is distinguished by the fused proper exciple and paraphyses that are not thickened at the apex. The ascospores in the material investigated have only slightly thickened walls and are clearly halonate. It is possible that they are not fully mature in the material available. *Topeliopsis darlingtonii* is distinguished from the other *Topeliopsis* species with transversely septate ascospores (chiefly *T. subdenticulata*), by stictic acid in the thallus and by the less emergent apothecia with a layered margin.

*Habitat and distribution.* This new species is so far known only from the type locality where it grows abundantly on the smooth, weathered bark at the base of a deciduous tree, in a moist, cool temperate, submontane rainforest in Queensland/Australia.

*Additional material examined.* **Australia:** Queensland: Darlington Range, c. 15 km SSW of Canungra, in a cool temperate submontane rainforest, 28°13'32"S, 153°07'42"E, 980 m, 2002, Kalb 33980 (hb. Kalb).

### *Topeliopsis elixii* A. Frisch & Kalb sp. nov.

Similis *Topeliopsis muscigenae*, sed thallo acidum hyposticticum et acidum hypoconsticticum continente et apotheciis non distincte urceolatis, disco late aperto et pruinoso differt.

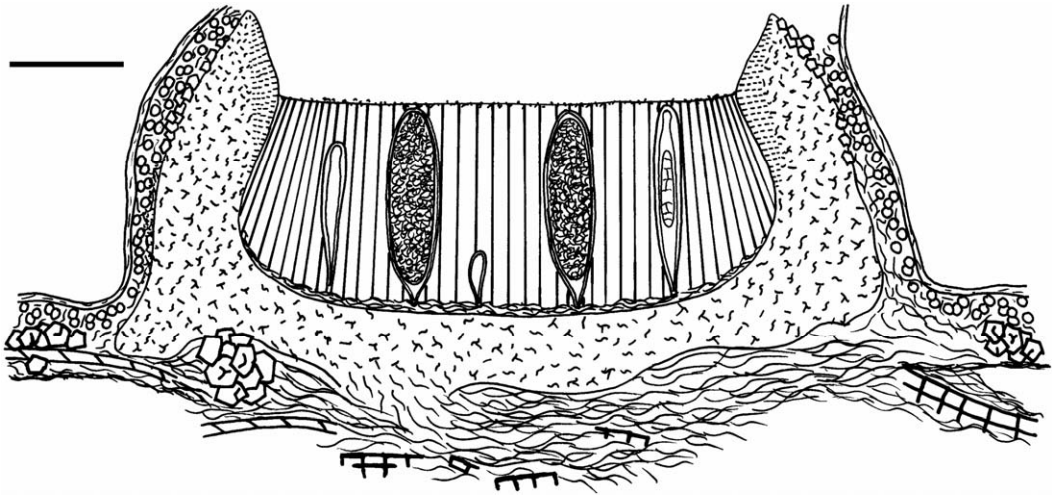


FIG. 3. *Topeliopsis elixii* (holotype), section of thallus and apothecium. Scale = 100  $\mu\text{m}$ .

Typus: Australia, Queensland, Darlington Range, c. 15 km SSW of Canungra, in a cool temperate submontane rainforest, 28°13'32"S, 153°07'42"E, 980 m alt., 16 August 2002, K. Kalb 33979 (CANB—holotypus; hb Kalb, hb Frisch—isotypi).

(Figs 1D, 3 & 5B)

*Thallus* muscicolous, olive-grey, thin (c. 0.03–0.12 mm), with a smooth to slightly verrucose, compact and glossy surface. *Prothallus line* thin, brownish. *Phenocortex* 10–15  $\mu\text{m}$  thick, without internal splitting, formed of strongly conglutinated periclinal hyphae. *Photobiont layer* 20–30  $\mu\text{m}$  thick, with a basal layer, up to 50  $\mu\text{m}$  thick, of oxalate crystals. *Medulla* indistinct to absent.

*Apothecia* frequent, dispersed, strongly emergent or with a slightly constricted base adnate to the thallus, 0.6–1.0 mm diam., with an incurved to rim-like margin and a narrow to wide, fissured pore. *Thallus margin* exfoliating and typically eroded at the apex, the crenate to deeply fissured, white to brownish white proper exciple exposed. *Hymenium* pale brown, finally flat, covered by a white, coarsely granular pruina. *Phenocortex* 10–15  $\mu\text{m}$  thick. *Photobiont layer* up to 40  $\mu\text{m}$  thick, with a basal layer of oxalate crystals. *Periderm layer* 10–15  $\mu\text{m}$  wide, hyaline to pale brownish, of similar structure to the proper exciple, indistinct. *Proper*

*exciple* cupular, hyaline, with a strongly conglutinated prosoplectenchyma which often becomes almost paraplectenchymatous in the central portions, up to 120  $\mu\text{m}$  deep at the base and 40–60  $\mu\text{m}$  wide laterally. *Periphysoids* prominent, running down to the base of the proper exciple, perpendicular to typically slightly down-turned, up to 20  $\mu\text{m}$  long and 2.5  $\mu\text{m}$  wide, with up to three rectangular cells. *Hymenium* 170–220  $\mu\text{m}$  high, clear. *Paraphyses* simple, dense and straight, 1.5–2  $\mu\text{m}$  wide, not thickened at the apex. *Epihymenium* colourless to very pale brown, 8–15  $\mu\text{m}$  high, interspersed by fine brownish granules and a few small oxalate crystals. *Asci* broadly clavate, c. 145–190  $\times$  25–48  $\mu\text{m}$ , without a well-developed tholus when mature. *Ascospores* 1/ascus, hyaline, densely muriform, halonate in young stages, 105–170  $\times$  22–45  $\mu\text{m}$ , with rounded ends, I+ purplish blue, spore development microcephalic.

*Pycnidia* not seen.

*Chemistry.* Hypostictic acid (major), hypoconstictic acid (minor) detected with TLC.

*Etymology.* The specific epithet refers to our friend and colleague, Prof. John A. Elix,

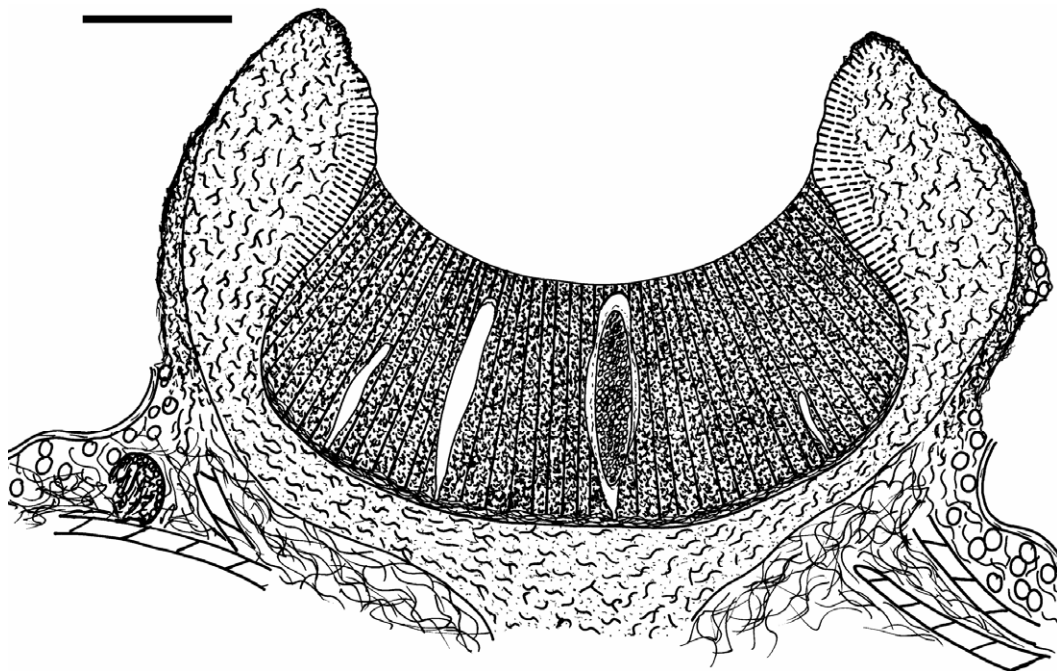


FIG. 4. *Topeliopsis meridensis* (holotype), section through thallus and apothecium. Scale=100  $\mu$ m.

Canberra, for his untiring support in chemistry as well as in the field.

*Remarks.* *Topeliopsis elixii* differs from *T. muscigena*, the only other species with a single densely muriform ascospore per ascus, by the presence of hypostictic and hypoconstictic acids in the thallus, and a flat, wide open disc which is covered by a distinct pruina. The apothecia are not typically urceolate.

*Habitat and distribution.* This new species is known only from the type locality where it grows abundantly over mosses at the base of a deciduous tree, in a moist, cool temperate, submontane rainforest in Queensland/Australia together with *T. darlingtonii*.

***Topeliopsis meridensis* Kalb & A. Frisch sp. nov.**

Similis *Topeliopsis muscigenae*, sed hymenio dense insperso et excipulo brunneo differt.

Typus: Venezuela, Merida, Distr. Rangel, between Laguna Mucubaji and Laguna Negra, c. 15 km SE of

Apartaderos, over mosses in a paramo, 08°45'S, 70°45'E, 3500 m alt. 15 August 1989, K. & A. Kalb & López-Figueiras 34793 (hb. Kalb—holotypus).

(Figs 1F, 4 & 5C)

*Thallus* muscicolous, continuous, pale grey to pale brownish grey-olive, thin (c. 0.05–0.1 mm) to evanescent, with a smooth to slightly verrucose, compact and glossy surface. *Prothallus* line not seen. *Phenocortex* 8–12  $\mu$ m thick, without internal splitting, formed of strongly conglutinated periclinal hyphae. *Photobiont* layer 20–80  $\mu$ m thick. *Medulla* indistinct.

*Apothecia* few, dispersed, moderately to strongly emergent, 0.5–0.9 mm diam., broadly hemispherical to barrel-shaped, with an incurved rim and a c. 0.15–0.25 mm wide, rugged to radially-fissured, white to brownish white pore. *Thallus margin* exfoliating, largely eroded, the brown to black proper exciple exposed. *Hymenium* deeply urceolate, dark, epruinose. *Phenocortex* 8–12  $\mu$ m thick. *Photobiont* layer c. 25  $\mu$ m thick. *Periderm* layer 20–25  $\mu$ m wide, brown, of similar

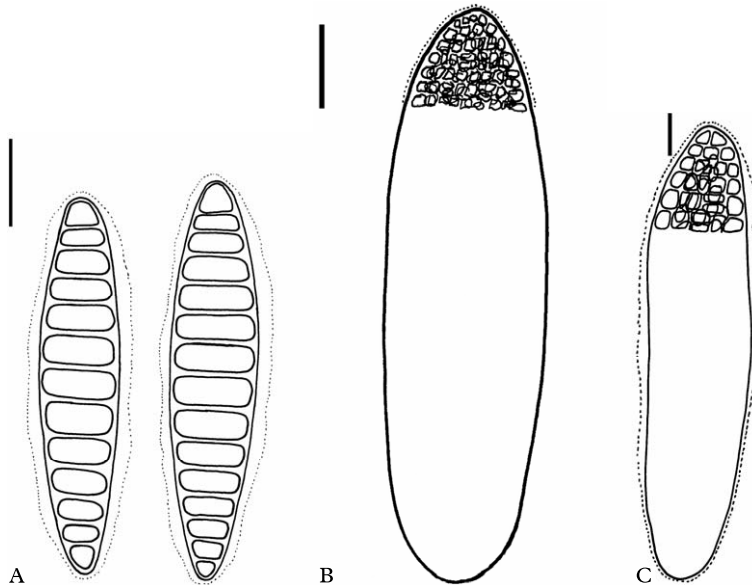


FIG. 5. Ascospores of *Topeliopsis* species. A, *T. darlingtonii* (holotype); B, *T. elixii* (holotype); C, *T. meridensis* (holotype). Scales: A & C=10 µm; B=20 µm.

structure to the proper exciple, indistinct. *Proper exciple* cupular, brown, composed of a strongly conglutinated prosoplectenchyma becoming almost paraplectenchymatous in the central portions, up to 60 µm deep at the base and 55–80 µm wide laterally. *Periophysoids* prominent, running down to the base of the proper exciple, perpendicular to slightly down-turned, up to 30 µm long and 2.5–3.0 µm wide, with up to four rectangular cells. *Hymenium* 170–190 µm high, strongly inspersed with minute spherical droplets. *Paraphyses* simple, dense and straight, 2–2.5 µm wide, not thickened at the apex. *Epihymenium* pale brown to pale greenish brown, 10–15 µm high. *Asci* broadly clavate, c. 140–155 × 28–39 µm, without a well-developed tholus when mature. *Ascospores* 1/ascus, hyaline, densely muriform, halonate in young stages, 105–112 × 22–28 µm, with rounded ends, I– (see remarks!), spore development microcephalic.

*Pycnidia* not seen.

*Chemistry*. K – , C – , PD – ; material too scanty for TLC.

*Etymology*. The specific epithet refers to the type locality in the state of Merida in Venezuela.

*Remarks*. The inspersed hymenium and the brown pigmentation of the proper exciple of *Topeliopsis meridensis* are unique in the genus. These features separate the new species from the similar *Topeliopsis muscigena*. *Topeliopsis elixii*, the only other *Topeliopsis* species with a single muriform ascospore per ascus, differs by the finally flat, pruinose disc and by its chemistry, i.e. the presence of hypostictic and hypoconstictic acids. The type material of *Topeliopsis meridensis* is scanty and the ascospores appear to be not fully mature. This might explain the lack of amyloidity of the endospore, which is otherwise characteristic of the genus.

*Habitat and distribution*. This new species is known only from the type locality where it was found growing sparsely over mosses at the base of a deciduous tree, in a moist, light paramo-vegetation along a creek. This

ecology agrees well with that of the other species in the genus.

### The New Combinations

#### *Topeliopsis subdenticulata* (Zahlbr.) A. Frisch & Kalb comb. nov.

Basionym: *Ocellularia subdenticulata* Zahlbr., in Skottsberg, C. (ed.), *The Natural History of Juan Fernandez and the Easter Island*, vol. 2, Botany: 329 (1924); type: Juan Fernandez Islands, Masafuera, "nördlicher Teil des hohen Kammes, auf bemoosten *Dicksonia*-Stämmen", C. & I. Skottsberg (W—holotype).

*Topeliopsis vezdae* Kalb, *Mycotaxon* 79: 323 (2001); type: Australia, Queensland, Styx River State Forest, c. 68 km E of Armidale, cool temperate rainforest along a rivulet, 30°34'S, 152°13'E, 800 m alt., 11 viii 1988, K. Kalb & J. Williams 19199 (CANB—holotype).

*Ocellularia patagonica* Imshaug ined.; Chile, Magallanes, Isla Desolacion, Hebe scrub along S shore of Caleta San José, Bahia Tuesday, 52°51'S, 74°28'W, 04 x 1969, H. Imshaug & K. Ohlsson 44750 (H).

(Fig. 1G)

#### *Topeliopsis decorticans* (Müll. Arg.) A. Frisch & Kalb comb. nov.

Basionym: *Thelotrema decorticans* Müll. Arg., *Bull. Herb. Boissier* 1: 54 (1893); type: Australia, Victoria, Black Spur, 1892, F. R. M. Wilson 514 (G!—holotype).

*Topeliopsis corticola* Kalb, *Mycotaxon* 79: 322 (2001); type: Australia, Blue Mountains National Park, Mount Wilson, Chimney Cottage, in a moist cool temperate rainforest, 33°29'S, 152°25'E, 1000 m alt., 10 viii 1988, K. Kalb & J. Williams 21227 (CANB—holotype).

(Fig. 1C)

### Ascoconidia

Pycnidia have not been reported from any *Topeliopsis* species so far. However, ascoconidia are produced in old ascospores of *Topeliopsis elixii* (and of *T. muscigena*; G. Kantvilas, pers. comm.), a type of conidiogenesis that has already been described for several lichenized ascomycetes (Hafellner & Bellemère 1983; Santesson 1952). Ascospore development and conidiogenesis could not be studied in all details because of the lack of adequate material, and only some

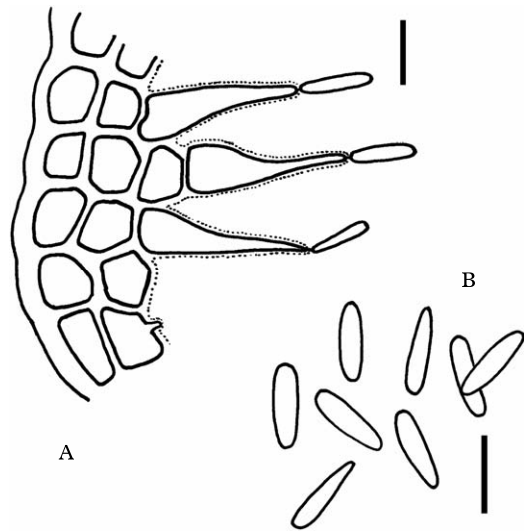


FIG. 6. Ascoconidia in *Topeliopsis elixii* (holotype). A, transverse section of old ascospore showing 2–3 layers of ascospore cells and ascoconidia; B, ascoconidia. Scales: A & B = 5 µm.

major observations are recorded here. The microcephalic ascospores of *Topeliopsis elixii* are produced singly from the beginning and are already muriform in the earliest stages observed. A large cavity is formed in some of the older ascospores by the separation and disintegration of the central cells. This cavity is bordered by 2–3 layers of ascospore cells. Ascoconidia are formed from the innermost circle of cells that borders the central cavity, into which they are finally released. The ascoconidia are produced acrogenously on bottle-shaped phialides, c. 5–13 × 1.5–2 µm, which appear first as small papillae and later grow out to their normal size. Using light microscopy, it could not be demonstrated without doubt whether the phialides are separated from the ascospore cells by a transverse septum or not. However, the former seems to be the case. Therefore, the conidiophores are of Vobis' types I or II (Vobis 1980). The ascoconidia are 4.5–6 × 1.2–1.5 µm in size and rather irregularly bacilliform to narrow elliptical or claviform (Fig. 6A & B).

The conidiogenesis of *Topeliopsis elixii* differs from that described in Hafellner &



Bellemère (1983) for *Brigantiaea leucoxantha* mainly in the formation of distinct conidigenous cells, whereas the ascoconidia of *B. leucoxantha* are produced on small papillae which are formed pleurogenously on the isolated central ascospore cells. Furthermore, the production of conidia in *B. leucoxantha* was described as occurring on all central ascospore cells, whereas in *Topeliopsis elixii* it is restricted to the cell layer bordering the central cavity.

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