Lachnaceae in New Zealand - Aotearoa

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P.R. Johnston, December 2023

Introduction

Lachnaceae is a family of small, stalked, usually brightly coloured cup fungi (*Leotiomycetes*, the 'inoperculate discomycetes'), characteristically with their apothecia having hairs. Most species have been described as saprobes on fallen dead plant tissue, but they have also been isolated as endophytes from living leaves and roots (e.g. Johnston et al. 2011). Some species known only from their asexual state have been placed in morphologically similar but phylogenetically distant genera such as the beetle-associated '*Chrysosporium*' *filiforme* (Sigler et al. 1982) that DNA sequences (GenBank AJ131680 ex type specimen) show is a *Lachnellula* sp. (*Lachnaceae*).

Most of the scanty New Zealand literature on morphologically similar fungi has treated species now accepted in *Lachnaceae* as the family *Hyaloscyphaceae* sensu Nannfeldt (1932). The most obvious defining character of this concept of the family is that the apothecia are hairy and the excipular cells rather thin-walled. Raitviir (2004) modified Nannfeldt's concept of *Hyaloscyphaceae*, raising two subfamilies *Hyaloscyphoideae* and *Lachneae* to the family level as *Hyaloscyphaceae* and *Lachnaceae*. Recent molecular phylogenetic studies have supported this scheme, the two families now known to have a distant relationship within *Helotiales*, and fungi having apothecia with hairs being found scattered across *Helotiales* (e.g. Han et al. 2014). *Lachnaceae* sensu Raitviir (2004) is strongly supported in recent multigene analyses (e.g. Johnston et al. 2019, Johnston & Baschien 2020). In addition, ITS based analyses also generally strongly support this clade (e.g. Guatimosim et al. 2016). ITS-based phylogenies place the genera *Albotricha*, *Brunnipila*, *Capitotricha*, *Dasyscyphella*, *Erioscyphella*, *Incrucipulum*, *Lachnellula*, *Lachnopsis*, *Proliferodiscus*, and *Velebitea* in *Lachnaceae* (Hosoya et al. 2010, Peric & Baral 2014, Guatimosim et al. 2016, Kušan et al. in Phookamsak et al. 2019). All these genera have rough walled hairs. Although well resolved phylogenetically, these genera remain difficult to distinguish morphologically (e.g. Tochihara & Hosoya 2022). Basal to *Lachnaceae* is a clade including several genera with smooth-walled hairs — *Lasiobelonium*, *Solenopezia*, *Trichopeziza*, and *Trichopezizella* — included in *Lachnaceae* by Johnston et al. (2019) but treated as *Solenopeziaceae* by Johnston & Baschien (2020), using a concept of the family modified from the original circumscription of Ekanayaka et al. (2019).

Based on specimens with DNA sequences available (many of these still to be publicly released), species of *Lachnaceae* from New Zealand are known from the genera *Albotricha*, *Capitotricha*, *Erioscyphella*, *Lachnellula*, *Lachnum* sensu stricto, *Lachnopsis*, *Proliferodiscus*, and *Velebitea* (Fig. 1). Based on the same dataset, genera not known to occur in New Zealand include *Brunnipila* and *Incrucipilum*. In contrast, there are some New Zealand species that do not seem to fit phylogenetically into any existing genus, such as '*Lachnum' willisii* (e.g. PDD 112217), a morphologically highly divergent *Cudoniella*-like species (e.g. PDD 108691 and related specimens), and a phylogenetically divergent species with delicate, white apothecia on wood (PDD 119495 and related specimens). Most of New Zealand's species of *Lachnaceae* remain unnamed.

Many specimens of *Lachnaceae* without DNA sequences are in the New Zealand Fungarium/ Te Kohinga Hekaheka o Aotearoa (PDD), and few of these have been critically examined morphologically. It is expected that many additional records of the species discussed below will be found, as well as additional species currently without DNA sequences. For example, in a current ongoing study on the genus *Lachnopsis* in New Zealand 23 species have DNA sequences available, but there are another four clearly morphologically distinct species that as yet have no DNA sequences (unpubl. data).

Methods

The trees presented are all based on ITS sequences only. The ML trees were generated using IQTree, with the model SYM+R5. Bootstrap values are provided when >90%. Aotearoa-relevant clade names are provided to the right of the trees, many of these representing informal tag names for unnamed species. *Solenopeziaceae* was used as the outgroup.

PDD numbers refer to dried specimens in the New Zealand Fungarium/ Te Kohinga Hekaheka o Aotearoa and ICMP numbers to living cultures in the International Collection of Microorganisms from Plants/Te Kohinga Hekaheka Ora o Aotearoa. Note that most of the DNA sequences were generated from mycelium from cultures grown from germinated ascospores, but many of these cultures have yet to be formally accessioned into ICMP. Details of most specimens can be found through https://scd.landcareresearch.co.nz/, and this web resource also provides images for some of the specimens.

Results and Discussion

Brief notes are provided below on each of the genera treated in Figs 1–8.

***Albotricha* (Fig 7)**

A single unnamed species known from New Zealand, known also from Australia, with bright yellow apothecia, quite common on dead leaves of large monocots. Forms a clade strongly supported as sister to a clade including specimens from other parts of the world identified as *A. acutipila* and *A. albotestacea*.

***Asperopilum* (Fig 6)**

Asperopilum is monotypic, with the type species *A. juncicola*. This fungus is common on *Juncus* in New Zealand and is found also in Australia, although only New Zealand specimens have DNA sequences available. Based on a phylogeny derived from ITS sequences, *A. juncicola* falls in a strongly supported, monophyletic clade within *Lachnum*. Also in the *Asperopilum* clade are specimens identified as *Lachnum controversum*, *L. spartinae* and *L. apalum*, along with three unnamed species from New Zealand. All of the specimens in this clade that were sequenced from apothecia on host plant substrates were collected from monocotyledons, mostly grasses. One of the New Zealand species is also represented by a specimen from Australia (PDD 117545), on a host identified by the collector as *Gahnia*.

Asperopilum is morphologically distinct from typical *Lachnum* species in having paraphyses branched and slightly swollen towards the rounded apex, and a red reaction at the ascus apex when treated with Lugol's Iodine (IKI) (no reaction with Melzers reagent). *Lachnum* species typically have lanceolate paraphyses and blue reaction at the ascus apex with both IKI and Melzers reagent. The hairs of *Asperopilum* are roughened but shorter than typical for *Lachnum*.

The other fungi in the clade with *Asperopilum* all have ascus pores reacting blue with iodine and the lanceolate paraphyses typical for *Lachnum*. However, they share with *Asperopilum* excipular cells that are short cylindric to more or less globose, with thickened or slightly thickened walls. Most species of *Lachnum* have excipular cells with thin walls. See:

- https://scd.landcareresearch.co.nz/Specimen/PDD_108737 for *Lachnum* cf. *apalum*

- https://scd.landcareresearch.co.nz/Specimen/PDD_42648 for *L. controversum* (ex Sydow Mycotheca Germanica No. 1945)
- https://scd.landcareresearch.co.nz/Specimen/PDD_93687 for a *L. controversum*-like species from New Zealand (differs phylogenetically from Northern Hemisphere specimens and in ascospore shape)
- https://scd.landcareresearch.co.nz/Specimen/PDD_117544 for *Lachnum* sp. "Cortaderia red"
- https://scd.landcareresearch.co.nz/Specimen/PDD_99993 for *Asperopilum juncicola*

Lachnum spartinae was described as having thin-walled excipular cells, but the images in Cantrell et al. (1996 - Mycotaxon 57: 479-485) seem to show somewhat thickened walls.

The ITS phylogeny places the *Asperopilum* clade within *Lachnum* s.s., making *Lachnum* paraphyletic. A multigene analysis places species representing the *Asperopilum* clade sister to the type species of *Lachnum, L. virgineum* (see Johnston 2022, https://doi.org/10.7931/gx9a-c781). However, in this analysis *Lachnum* s.s. is represented by only by two *L.* cf. *virgineum* specimens. Additional multigene data are needed to test whether this relationship is robust, or whether the *Asperopilum* clade will continue to result in a paraphyletic *Lachnum*.

Brunnipila **(Fig 8)**

Four species with sequences in GenBank form a strongly resolved clade in the ITS phylogeny (Fig. 1); no New Zealand specimens that have been sequenced belong in this clade.

Capitotricha **(Fig 7)**

A single unnamed species from New Zealand, with white concolorous, densely hairy apothecia on wood, represented by PDD 104630 and PDD 112210. Phylogenetically this New Zealand species is close to a specimen collected from *Nothofagus* in Chile (PRM 909286, GenBank LT904862), with an ITS match of 97.8%. The Southern Hemisphere species have a strongly supported sister relationship with several *Capitotricha* species from the Northern Hemisphere.

Dasyscyphella **(Fig 5 and Fig 8)**

Dasyscyphella is not monophyletic in the ITS tree (Fig. 1). Clades represented by specimens identified as *D. nivea* and *D. montana* are distant within the ITS tree. *D. montana* and *D. nivea* are very similar morphologically, according to Raitviir & Sacconi (1987) they differ in the colour of the dried apothecia and in ascus length.

Specimens from Europe and North America identified as *D. nivea* have an ITS sequence identical to specimens from New Zealand (Fig 8). In New Zealand this species is common on fallen wood; apothecia delicate, concolorous white when fresh, drying yellowish, with distinctive hairs slightly swollen, rough walled near the base and smooth at the tips.

A second, unnamed New Zealand species, represented by PDD 99164 (Fig 5), is phylogenetically close to specimens identified as *D. montana* from Japan (FC-2031, GenBank AB481241, ITS a 97.9% match) and Europe (H.B. 6874, GenBank OM456231, ITS a 96.4% match).

Erioscyphella **(Fig 4)**

The clade here accepted as *Erioscyphella* is strongly supported in the ITS phylogeny (Fig 1), and the same breadth of taxa is supported as monophyletic in a multigene phylogeny with up to 15 genes (Johnston 2020-2022). This clade matches the concept of Tochihara & Hosoya (2022) but includes some additional taxa of particular relevance to New Zealand; ‘*Arachnopeziza*’ *rhopalostylidis*, ‘*Lachnum*’ *berggrenii*, ‘*Lachnum*’ *nothofagi*, in additional to about six unnamed species (Fig 4). The unnamed species all appear to be host specialised and include two species on the tree fern *Cyathea* (one on *C. smithii*, one on *C. dealbata*), one on *Dracophyllum* (closely related to specimens from Australia also on *Epacridaceae*), another on *Phormium*, and another on *Asplenium*.

Also in New Zealand are the geographically widespread species *Erioscyphella brasiliensis* and *E. abnormis*. The New Zealand specimens referred to ‘*Lachnum*’ *palmae* are on a long branch in the *Erioscyphella* clade. This New Zealand species differs phylogenetically from specimens from Japan (Tochihara & Hosoya 2022) and China (GenBank MG283320), and whether either the Asian or New Zealand specimens represent the same species as the type specimen (from Central America) remains unknown. The New Zealand fungus is characterised by ascospores (45-) 70-80 µm long, with a row of small vacuoles stretching down the whole spore, the excipular tissue comprising long-cylindric, somewhat tangled, thick-walled, forming an agglutinated to gelatinous tissue. The morphologically similar palm-inhabiting species from Australia, *L. pritzelianum*, differs in having shorter spores and lacking gelatinous tissue in the excipulum, based on the description of Spooner (1987).

All of the New Zealand taxa in this clade share gelatinous (or at least thick-walled) excipular cells.

***Incrucipilum* (Fig 8)**

Four species with sequences in GenBank form a strongly resolved clade in the ITS phylogeny (Fig. 1); no New Zealand specimens that have been sequenced belong in this clade.

***Lachnaceae* gen. nov. 1 (Fig 5)**

The clade referred here to *Lachnaceae* gen. nov. 1 contains a single unnamed species, common in North Island of New Zealand on fallen decorticated wood. Atypical of *Lachnaceae*, this fungus does not have obvious hairs on the apothecia, which macroscopically resemble *Cudoniella*. Its position within *Lachnaceae* has been confirmed with a phylogeny based on a set of 15 genes extracted from a genome generated from PDD 119490 (Johnston 2020–2022). The excipulum comprises tangled hyphae with gelatinous walls. The outside of the receptacle has scale-like clumps of tissue that comprise loose, cylindric, smooth, thin-walled cells, that could be interpreted as reduced hairs.

***Lachnaceae* gen. nov. 2 (Fig 5)**

A single unnamed New Zealand species, common on fallen wood of *Nothofagus*, with a sister species in Australia, again on *Nothofagus* wood. Morphologically these species recall *Cyathicula* macroscopically, and have a heavily gelatinised excipulum, but the excipular elements comprise tangled rather than parallel hyphae. There is a poorly developed layer of flexuous and partly tangled hairs on the receptacle, these having roughened walls.

***Lachnaceae* on *Carex* (Fig 7)**

Represented by a single sequenced specimen (PDD 61822), the ITS sequence is close to a species on *Nothofagus* wood, but with poor support for a phylogenetic relationship.

***Lachnaceae* on *Nothofagus* wood (Fig 7)**

A unnamed New Zealand species, represented by PDD 82928 and PDD 110298, has white, densely hairy apothecia on wood. It is phylogenetically closest to a Norwegian specimen identified as ‘*Lachnum*’ *rhytismatis* (note that this specimen was on *Vaccinium* leaves, while the type specimen is on leaves of *Acer* leaves but it matches closely a specimen from Switzerland from *Acer*, TNS-F-65645, GenBank LC424835).

Lachnaceae** on **Weinmannia **(Fig 5)**

Represented by a single sequenced specimen (PDD 93937), the ITS sequence provides no support for a relationship to a named genus within the family.

Lachnellula **(Fig 8)**

There are two sequenced species in New Zealand, one of these tentatively identified morphologically as *L. resinaria*. Represented by two specimens and known only from pine, this species is assumed to be exotic. Based on accessions in GenBank and UNITE, there are two genetic concepts of *L. resinaria*, one from Europe (UNITE UDB07672759, TUF139151; GenBank MN719894, G.M. 2015-08-02), the other from North America and Japan (GenBank AB481246, TNS-F-16450 (FC-2304); GenBank MT913605, MICH 340549). The New Zealand specimen has an ITS sequence with a 97% match to the European concept of *L. resinaria*, about 91% to the North American concept.

The second New Zealand species is unnamed and has been found once, on *Nothofagus* wood.

Lachnopsis **(Figs 2 and 3)**

DNA sequencing and morphological examination has revealed at least 23 *Lachnopsis* species in New Zealand. Only three of these can be unequivocally linked to named species, '*Lachnum*' *pteridophyllum*, '*Lachnum*' *filiceum* and '*Lachnum*' *pteridicola*. Note that specimens with sequences in GenBank that have been identified as *Lachnum pteridophyllum* represent two distinct species, one from China is an *Erioscyphella* (Perić & Baral 2014), the other from Puerto Rico is basal within *Lachnopsis* (Guatimosim et al. 2016). Biogeographically, neither is likely to represent the same species as the type of *L. pteridophyllum*, originally described from Tasmania. Although Tasmania material has not been available to sequence, several specimens from New Zealand that morphologically match *L. pteridophyllum* as described by Spooner (1987) are within *Lachnopsis* but phylogenetically distinct from the species reported as this species from Puerto Rico. Based on these data, reports of this species being widely distributed across tropical regions are doubtful.

With few exceptions globally, species in *Lachnopsis* inhabit ferns. In contrast, few species in other genera of *Lachnaceae* inhabit ferns. For example, of the named and unnamed New Zealand *Lachnaceae* species in genera apart from *Lachnopsis* that have DNA sequences available, only three of the approximately 47 species (two in *Erioscyphella*, one in *Lachnum*) are found on ferns.

Two of the *Lachnopsis* species on substrates other than ferns (PDD 91757 on *Beilschmiedia tawa* and PDD 93117 on *Leucopogon fasciculatus*) are morphologically unusual for the genus in having asci thin-walled at the apex and with no amyloid reaction. In a traditional morphological sense, these species match *Perottia* sensu Spooner (1987), a genus he discussed as being close to *Lachnellula*. Although the lack of an amyloid ascus pore is a distinctive and easily observed feature, Baral & Matheis (2000) regarded it as taxonomically uninformative and they reject this as a character useful for distinguishing *Perottia* from *Lachnellula*. Our two *Perottia*-like fungi are deep within the *Lachnopsis* clade and phylogenetically distant from specimens accepted as *Lachnellula*. These *Perottia*-like fungi have excipular tissue that is less gelatinous then typical for *Lachnellula*.

Lachnum **(Fig 6)**

The ITS tree resolves a strongly supported *Lachnum* s.s. clade, but included in this clade is the monotypic *Asperopilum juncicola*. Although *A. juncicola* is morphologically divergent from most *Lachnum* species, this phylogenetic relationship is supported by a multi-gene analysis (see notes above under *Asperopilum*).

Most of the New Zealand species of *Lachnum* are found on dead leaves of monocotyledons, with a few *L. virgineum*-like species on wood. Based on small differences in ITS sequences, there appear to be a complex of wood-inhabiting species close to *L. virgineum* and another complex of monocotyledon-inhabiting species close to *L. hyalopus* and *L. apalum*.

These taxa need to be carefully studied in detail using both morphological and molecular data but some tentative notes are included here. *Lachnum hyalopus* (a *Phormium* specialist), *Lachnum apalum* var. *beatonii* (a *Juncus* specialist), and unnamed *Lachnum* species on *Carex* (PDD 117556), *Astelia* (PDD 71062) and *Cyathea* (PDD 112178) are phylogenetically very close. Collectively, their ITS sequences have a 98.7% match and the various species lack unique sets of consistent nucleotide changes. However, backing up the host-related species structure are morphological differences, especially in ascospore size and shape of the excipular cells. *L. apalum* var. *beatonii* has longer ascospores than *L. hyalopus* (40–65 µm versus 30–45 µm), short-cylindric, more or less square, excipular cells versus long-cylindric excipular cells, and hairs undifferentiated compared to slightly swollen at the tips. The species on *Astelia* has ascospores 15–20 × 2.5 µm, short and broad excipular cells and hairs slightly swollen at the tips. The species on *Cyathea* has ascospores 55–75 × 2 µm and long-cylindric exipular cells.

'Lachnum' willisii **(Fig 8)**

Originally described from Australia, specimens matching morphologically and ecologically (growing on leaf tomentum of living leaves of *Asteraceae*) occur also in New Zealand. The dark brown, thick-walled hairs of this species are distinctive for *Lachnaceae*, and in the ITS tree it appears to be basal within *Lachnaceae*, but with low levels if support meaning that this position needs confirming with additional genes.

Neodasyscypha **(Fig 8)**

Sequenced specimens from New Zealand closely match specimens identified as *N. cerina* form North America and Europe, confirming genetically the broad geographic distribution of this wood-inhabiting species.

Perrotia **(Fig 7)**

Two GenBank accessions identified as the type species *Perrotia flammea*, one from Europe and one from North America, represent different species, although forming a monophyletic clade in an ITS based phylogeny. No New Zealand sequences fall into this clade.

Several *Perrotia* species have been reported from New Zealand, but whether they belong in the genus phylogenetically is not known. There are some New Zealand species of *Lachnopsis* with a *Perrotia*-like morphology (see notes above) and it is possible that several phylogenetically distant fungi have been placed in *Perrotia* because of their distinctive ascus morphology. The specimens in the *P. flammea* clade are phylogenetically distant to a specimen identified in GenBank as *Perrotia distincta* (Fig 5).

Proliferodiscus **(Fig 5)**

Specimens morphologically typical of *Proliferodiscus dingleyae* are common on *Nothofagus* bark in New Zealand, and occasionally also on other woody substrates, and this fungus is sometimes also isolated as an endophyte from living leaves of *Nothofagus* (Fig 5). These specimens fall in a clade in the ITS tree with several specimens identified as *Proliferodiscus* from other parts of the world. However, based on variation in ITS sequences, the New Zealand specimens appear to represent a complex of perhaps four separate species. To keep in mind is the possibility of unusual variation within ITS sequences across a single species. From one of the collections sequenced (PDD 59362 ex *Ulex*), divergent sequences were generated from two different apothecia, each sequence from a very clear .abi file.

Also in this clade are specimens identified as *Perrotia distincta* (phylogenetically distant from the type of the genus, *Perrotia flammea*).

Velebitea **(Fig 8)**

One New Zealand specimen collected from decorticated wood (PDD 108745) is an unnamed species phylogenetically close to the monotypic *Velebitea chrysotexta*. Although *V. chrysotexta* was recombined in *Dasyscyphella* by Baral & Quijada (2020), Kušan et al. in Phookamsak et al. (2019) discuss the reasons they did not use this genus for their new species, including lack of DNA sequence data for the type species of *Dasyscyphella*, the apparently polyphyletic nature of *Dasyscyphella* based on GenBank accessions (see notes above), and morphological differences between *V. chrysotexta* and the type species of *Dasyscyphella*, *D. cassandrae*. Phylogenetically, *Velebitea* forms a clade isolated within Lachnaceae, distant to any sequenced specimens identified as *Dasyscyphella*.

The New Zealand species has a 98% match to *V. chrysotexta*, and they share many micromorphological features; morphology of the hairs, paraphyses, ascospores, etc. Macroscopically the New Zealand species and *V. chrysotexta* are quite distinct.

References

Baral HO, Matheis W. 2000. Über sechs selten berichtete weißhaarige Arten der Gattung Lachnellula (Leotiales). Zeitschrift für Mykologie 66: 45–66.

Baral HO, Quijada L. 2020. Nomenclatural novelties. Index Fungorum 454: 1–3.

Ekanayaka AH, Hyde KD, Gentekaki E. McKenzie EHC, Zhao Q, Bulgakov TS, Camporesi E. 2019. Preliminary classification of Leotiomycetes. Mycosphere 10: 310–489.

Guatimosum E, Schwartsburd PB, Crous PW, Barreto RW. 2016. Novel fungi from an ancient niche: lachnoid and chalara-like fungi on ferns. Mycological Progress 15: 1239–1267. https://doi.org/10.1007/s11557-016-1232-6

Han JG, Hosoya T, Sung GH, Shin HD. 2014. Phylogenetic reassessment of Hyaloscyphaceae sensu lato (Helotiales, Leotiomycetes) based on multigene analyses. Fungal Biology 118: 150–167.

Hosoya T, Sasagawa R, Hosoya K, GieHo S, Hirayama Y et al. 2010. Molecular phylogenetic studies of Lachnum and its allies based on the Japanese material. Mycoscience 51: 170–181.

Johnston PR, Johansen RB, Williams AFR, Wilkie P, Park D. 2012. Patterns of fungal diversity in New Zealand Nothofagus forests. Fungal Biology 116: 401–412. https://doi.org/10.1016/j.funbio.2011.12.010

Johnston PR, Quijada L, Smith CA, Baral HO, Hosoya T, Baschien C, Pärtel K, Zhuang WY, Haelewaters D, Park D, Carl S, López-Giráldez F, Wang Z,Townsend JP. 2019. A multigene phylogeny toward a new phylogenetic classification for the Leotiomycetes. IMA Fungus 10: 1. https://doi.org/10.1186/s43008-019-0002-x

Johnston PR, Baschien C. 2020. Tricladiaceae fam. nov. (Helotiales, Leotiomycetes). Fungal Systematics and Evolution 6: 233–242. https://doi.org/10.3114/fuse.2020.06.10

Johnston PR 2020–2022. Leotiomycetes phylogeny updated. Manaaki Whenua – Landcare Research Datastore https://doi.org/10.7931/gx9a-c781

Nannfeldt JAF. 1932. Studien über die Morphologie und Systematik der nicht-lichenisierten inoperculaten Discomyceten. Nova Acta Regiae Societatis Scientiarum Upsaliensis, Ser. 4 (8): 1– 368.

Perić B, Baral HO. 2014. Erioscyphella curvispora spec. nov. from Montenegro. Mycologia Montenegrina 17: 89–104.

Phookamsak et al. 2019. Fungal diversity notes 929–1035: taxonomic and phylogenetic contributions on genera and species of fungi. Fungal Diversity 95: 1–273. https://doi.org/10.1007/s13225-019-00421-w

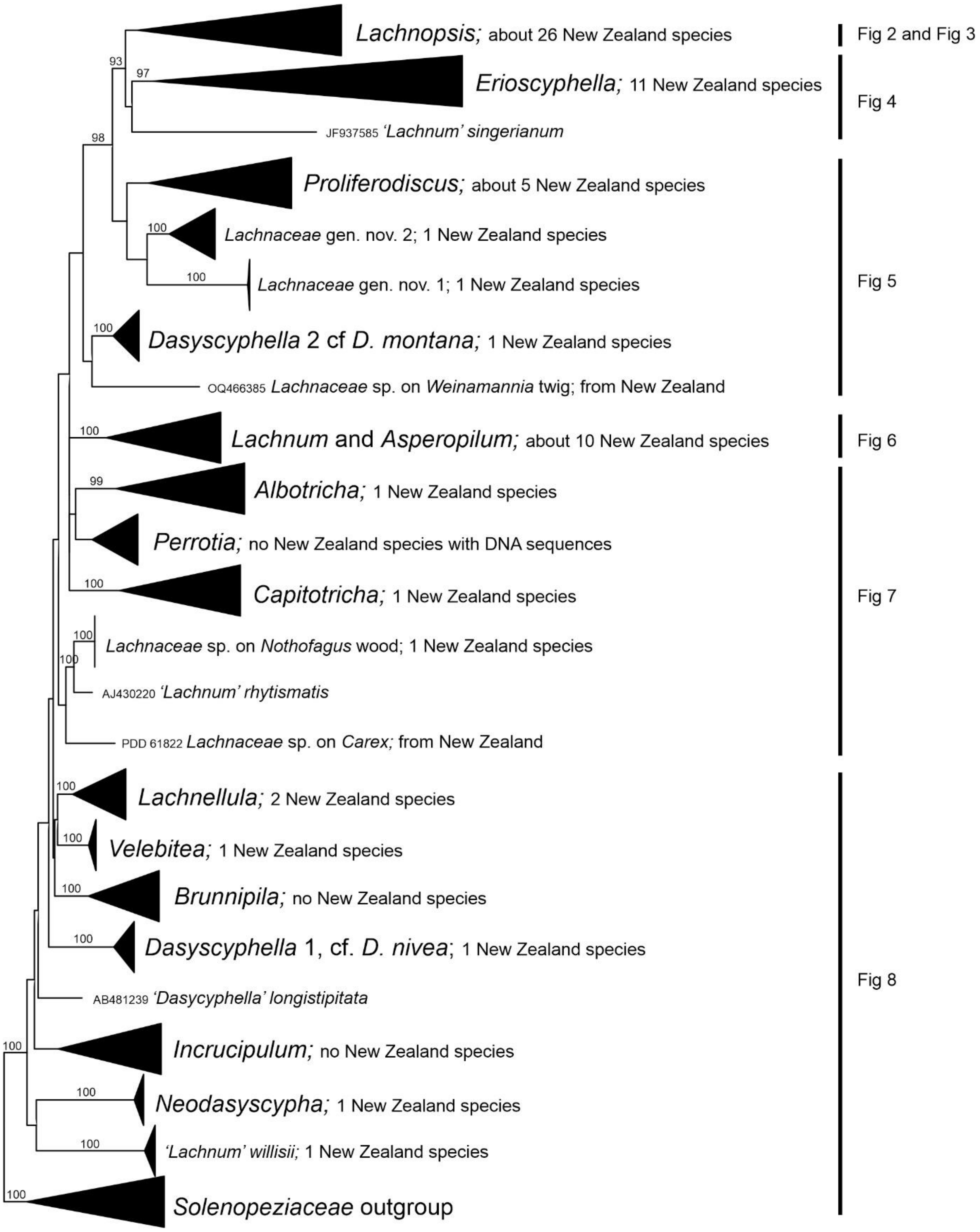
Raitviir A 2004: Revised synopsis of the Hyaloscyphaceae. Scripta Mycologica 20: 1–133.

Raitviir A, Sacconi S. 1987. Some interesting Hyaloscyphaceae from north Italy. Mycologica Helvetica 2: 165–171.

Sigler L, Whitney HS, Carmichael JW. 1982. Chrysosporium filiforme, a new hyphomycete associated with the bark beetle Dendroctonus ponderosae. Mycotaxon 14: 261–265.

Spooner BM. 1987. Helotiales of Australasia: Geoglossaceae, Orbiliaceae, Sclerotiniaceae, Hyaloscyphaceae. Bibliotheca Mycologica 116: 1–711.

Tochihara Y, Hosoya T. 2022. Examination of the generic concept and species boundaries of the genus Erioscyphella (Lachnaceae, Helotiales, Ascomycota) with the proposal of new species and new combinations based on the Japanese materials. Mycokeys 87: 1–52. https://doi.org/10.3897/mycokeys.87.73082


Lachnopsis; about 26 New Zealand species
Fig 2 and Fig 3
93
97
Erioscyphella; 11 New Zealand species
Fig 4
JF937585 'Lachnum' singerianum
98
Proliferodiscus; about 5 New Zealand species
100
Lachnaceae gen. nov. 2; 1 New Zealand species
100
Lachnaceae gen. nov. 1; 1 New Zealand species
Fig 5
100
Dasyscyphella 2 cf D. montana; 1 New Zealand species
OQ466385 Lachnaceae sp. on Weinamannia twig; from New Zealand
100
Lachnum and Asperopilum; about 10 New Zealand species
Fig 6
99
Albotricha; 1 New Zealand species
Perrotia; no New Zealand species with DNA sequences
100
Capitotricha; 1 New Zealand species
Fig 7
100
Lachnaceae sp. on Nothofagus wood; 1 New Zealand species
100
AJ430220 'Lachnum' rhytismatis
PDD 61822 Lachnaceae sp. on Carex; from New Zealand
100
Lachnellula; 2 New Zealand species
100
Velebitea; 1 New Zealand species
100
Brunnipila; no New Zealand species
100
Dasyscyphella 1, cf. D. nivea; 1 New Zealand species
Fig 8
AB481239 'Dasycyphella' longistipitata
100
Incrucipulum; no New Zealand species
100
Neodasyscypha; 1 New Zealand species
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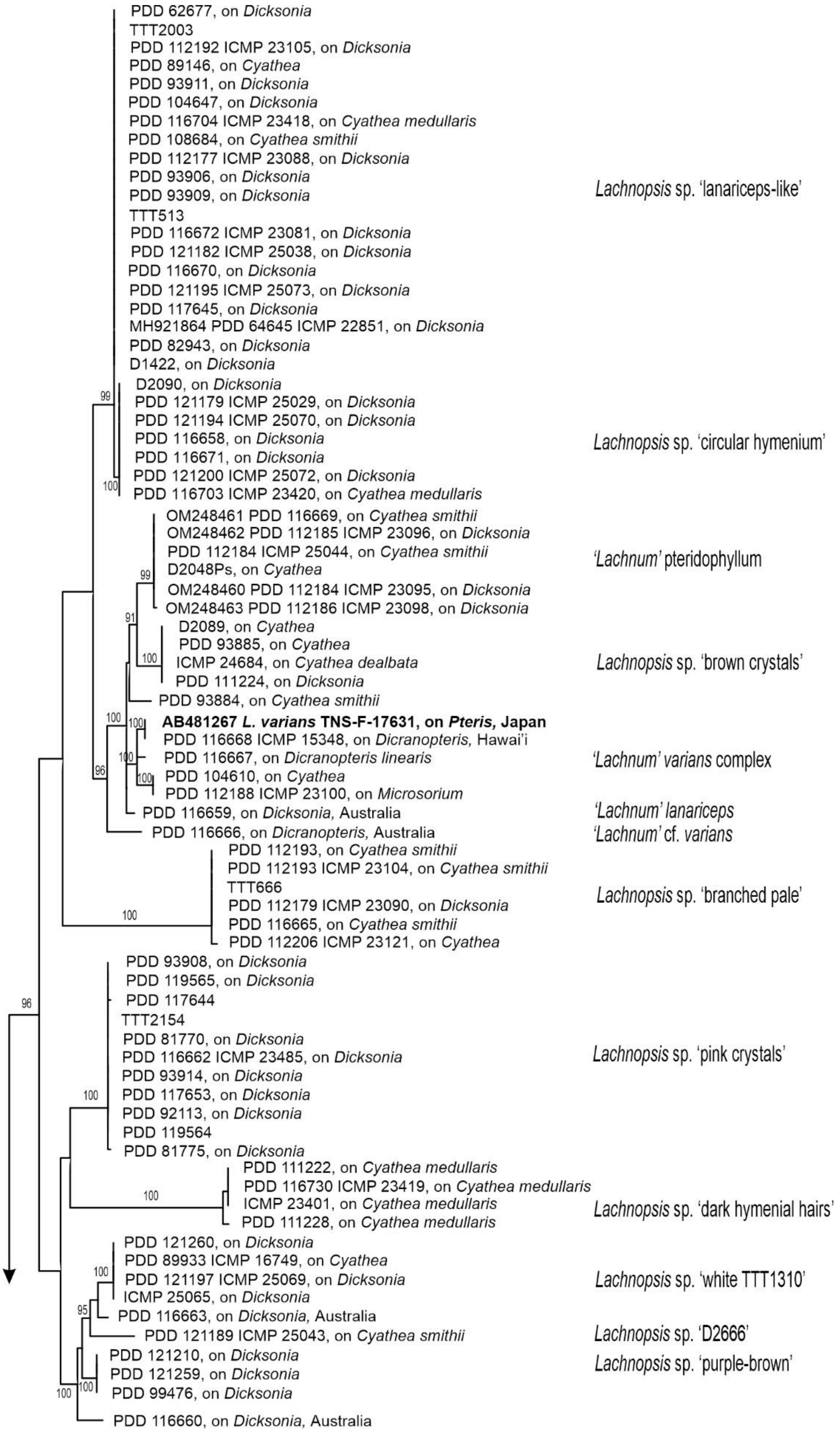
'Lachnum' willisii; 1 New Zealand species
100
Solenopeziaceae outgroup

Fig 1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PDD 104647, on *Dicksonia*
PDD 116704 ICMP 23418, on *Cyathea medullaris*
PDD 108684, on *Cyathea smithii*
PDD 112177 ICMP 23088, on *Dicksonia*
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Lachnopsis sp. 'lanariceps-like'
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D2090, on *Dicksonia*
PDD 121179 ICMP 25029, on *Dicksonia*
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PDD 116671, on *Dicksonia*
PDD 121200 ICMP 25072, on *Dicksonia*
100
PDD 116703 ICMP 23420, on *Cyathea medullaris*
Lachnopsis sp. 'circular hymenium'
OM248461 PDD 116669, on *Cyathea smithii*
OM248462 PDD 112185 ICMP 23096, on *Dicksonia*
PDD 112184 ICMP 25044, on *Cyathea smithii*
99
D2048Ps, on *Cyathea*
OM248460 PDD 112184 ICMP 23095, on *Dicksonia*
OM248463 PDD 112186 ICMP 23098, on *Dicksonia*
'Lachnum' pteridophyllum
91
D2089, on *Cyathea*
PDD 93885, on *Cyathea*
100
ICMP 24684, on *Cyathea dealbata*
PDD 111224, on *Dicksonia*
Lachnopsis sp. 'brown crystals'
PDD 93884, on *Cyathea smithii*
100
100
AB481267 *L. varians* TNS-F-17631, on *Pteris*, Japan
PDD 116668 ICMP 15348, on *Dicranopteris*, Hawai'i
100
PDD 116667, on *Dicranopteris linearis*
96
100
PDD 104610, on *Cyathea*
PDD 112188 ICMP 23100, on *Microsorium*
'Lachnum' varians complex
PDD 116659, on *Dicksonia*, Australia
'Lachnum' lanariceps
PDD 116666, on *Dicranopteris*, Australia
'Lachnum' cf. *varians*
PDD 112193, on *Cyathea smithii*
PDD 112193 ICMP 23104, on *Cyathea smithii*
TTT666
100
PDD 112179 ICMP 23090, on *Dicksonia*
PDD 116665, on *Cyathea smithii*
PDD 112206 ICMP 23121, on *Cyathea*
Lachnopsis sp. 'branched pale'
PDD 93908, on *Dicksonia*
PDD 119565, on *Dicksonia*
PDD 117644
96
TTT2154
PDD 81770, on *Dicksonia*
PDD 116662 ICMP 23485, on *Dicksonia*
PDD 93914, on *Dicksonia*
100
PDD 117653, on *Dicksonia*
PDD 92113, on *Dicksonia*
PDD 119564
PDD 81775, on *Dicksonia*
Lachnopsis sp. 'pink crystals'
PDD 111222, on *Cyathea medullaris*
PDD 116730 ICMP 23419, on *Cyathea medullaris*
100
ICMP 23401, on *Cyathea medullaris*
PDD 111228, on *Cyathea medullaris*
Lachnopsis sp. 'dark hymenial hairs'
PDD 121260, on *Dicksonia*
PDD 89933 ICMP 16749, on *Cyathea*
100
PDD 121197 ICMP 25069, on *Dicksonia*
ICMP 25065, on *Dicksonia*
Lachnopsis sp. 'white TTT1310'
95
PDD 116663, on *Dicksonia*, Australia
PDD 121189 ICMP 25043, on *Cyathea smithii*
Lachnopsis sp. 'D2666'
PDD 121210, on *Dicksonia*
PDD 121259, on *Dicksonia*
100
100
PDD 99476, on *Dicksonia*
Lachnopsis sp. 'purple-brown'
PDD 116660, on *Dicksonia*, Australia

Fig 2

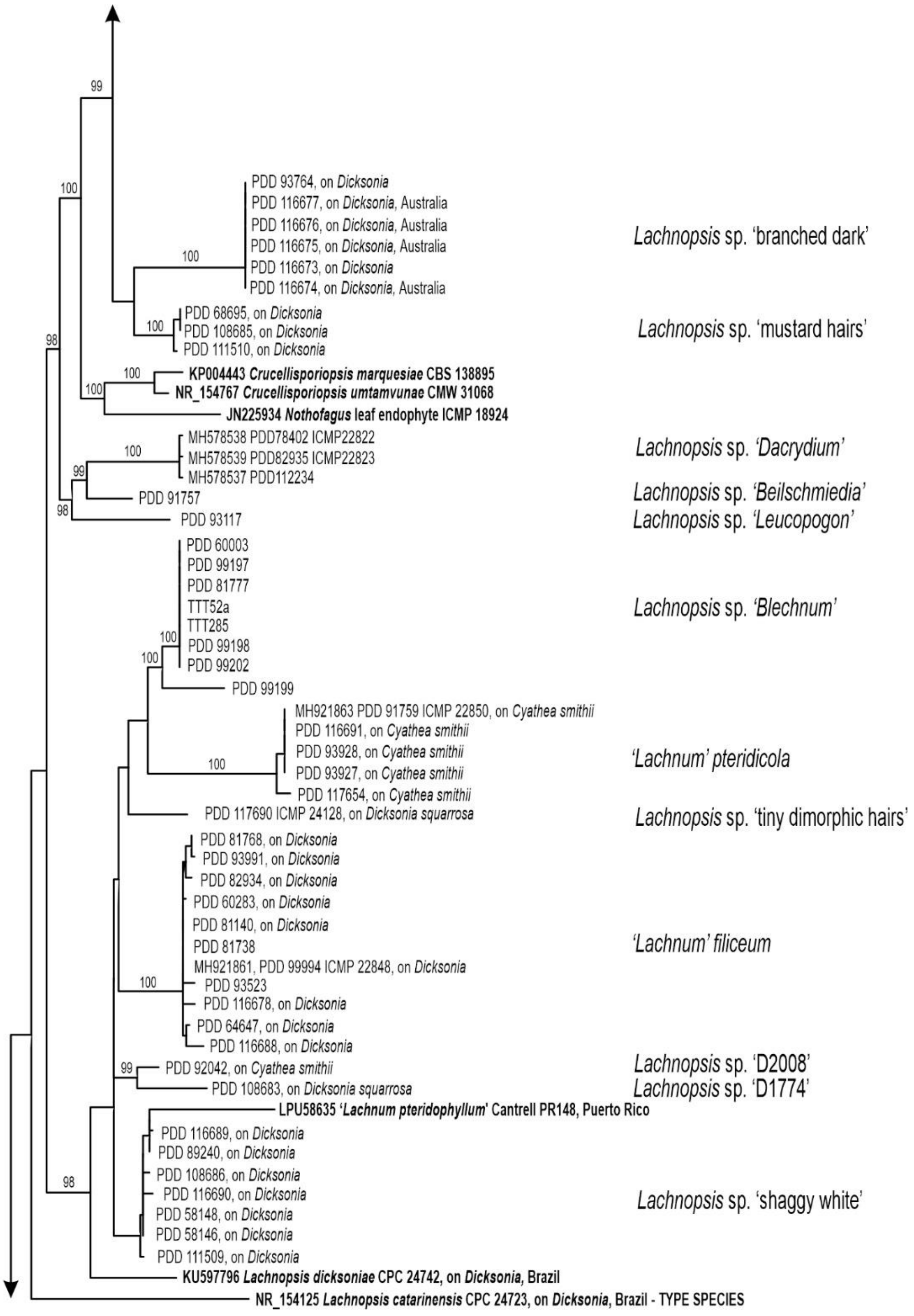

99
100
98
PDD 93764, on Dicksonia
PDD 116677, on Dicksonia, Australia
PDD 116676, on Dicksonia, Australia
PDD 116675, on Dicksonia, Australia
PDD 116673, on Dicksonia
PDD 116674, on Dicksonia, Australia
100
Lachnopsis sp. 'branched dark'
PDD 68695, on Dicksonia
PDD 108685, on Dicksonia
PDD 111510, on Dicksonia
100
Lachnopsis sp. 'mustard hairs'
100
KP004443 Crucellisporiopsis marquesiae CBS 138895
NR_154767 Crucellisporiopsis umtamvunae CMW 31068
100
JN225934 Nothofagus leaf endophyte ICMP 18924
MH578538 PDD78402 ICMP22822
MH578539 PDD82935 ICMP22823
MH578537 PDD112234
100
99
Lachnopsis sp. 'Dacrydium'
PDD 91757
Lachnopsis sp. 'Beilschmiedia'
98
PDD 93117
Lachnopsis sp. 'Leucopogon'
PDD 60003
PDD 99197
PDD 81777
TTT52a
TTT285
PDD 99198
PDD 99202
100
100
Lachnopsis sp. 'Blechnum'
PDD 99199
MH921863 PDD 91759 ICMP 22850, on Cyathea smithii
PDD 116691, on Cyathea smithii
PDD 93928, on Cyathea smithii
PDD 93927, on Cyathea smithii
PDD 117654, on Cyathea smithii
100
'Lachnum' pteridicola
PDD 117690 ICMP 24128, on Dicksonia squarrosa
Lachnopsis sp. 'tiny dimorphic hairs'
PDD 81768, on Dicksonia
PDD 93991, on Dicksonia
PDD 82934, on Dicksonia
PDD 60283, on Dicksonia
PDD 81140, on Dicksonia
PDD 81738
MH921861, PDD 99994 ICMP 22848, on Dicksonia
PDD 93523
PDD 116678, on Dicksonia
PDD 64647, on Dicksonia
PDD 116688, on Dicksonia
100
'Lachnum' filiceum
99
PDD 92042, on Cyathea smithii
Lachnopsis sp. 'D2008'
PDD 108683, on Dicksonia squarrosa
Lachnopsis sp. 'D1774'
LPU58635 'Lachnum pteridophyllum' Cantrell PR148, Puerto Rico
PDD 116689, on Dicksonia
PDD 89240, on Dicksonia
PDD 108686, on Dicksonia
PDD 116690, on Dicksonia
PDD 58148, on Dicksonia
PDD 58146, on Dicksonia
PDD 111509, on Dicksonia
98
Lachnopsis sp. 'shaggy white'
KU597796 Lachnopsis dicksoniae CPC 24742, on Dicksonia, Brazil
NR_154125 Lachnopsis catarinensis CPC 24723, on Dicksonia, Brazil - TYPE SPECIES

Fig 3

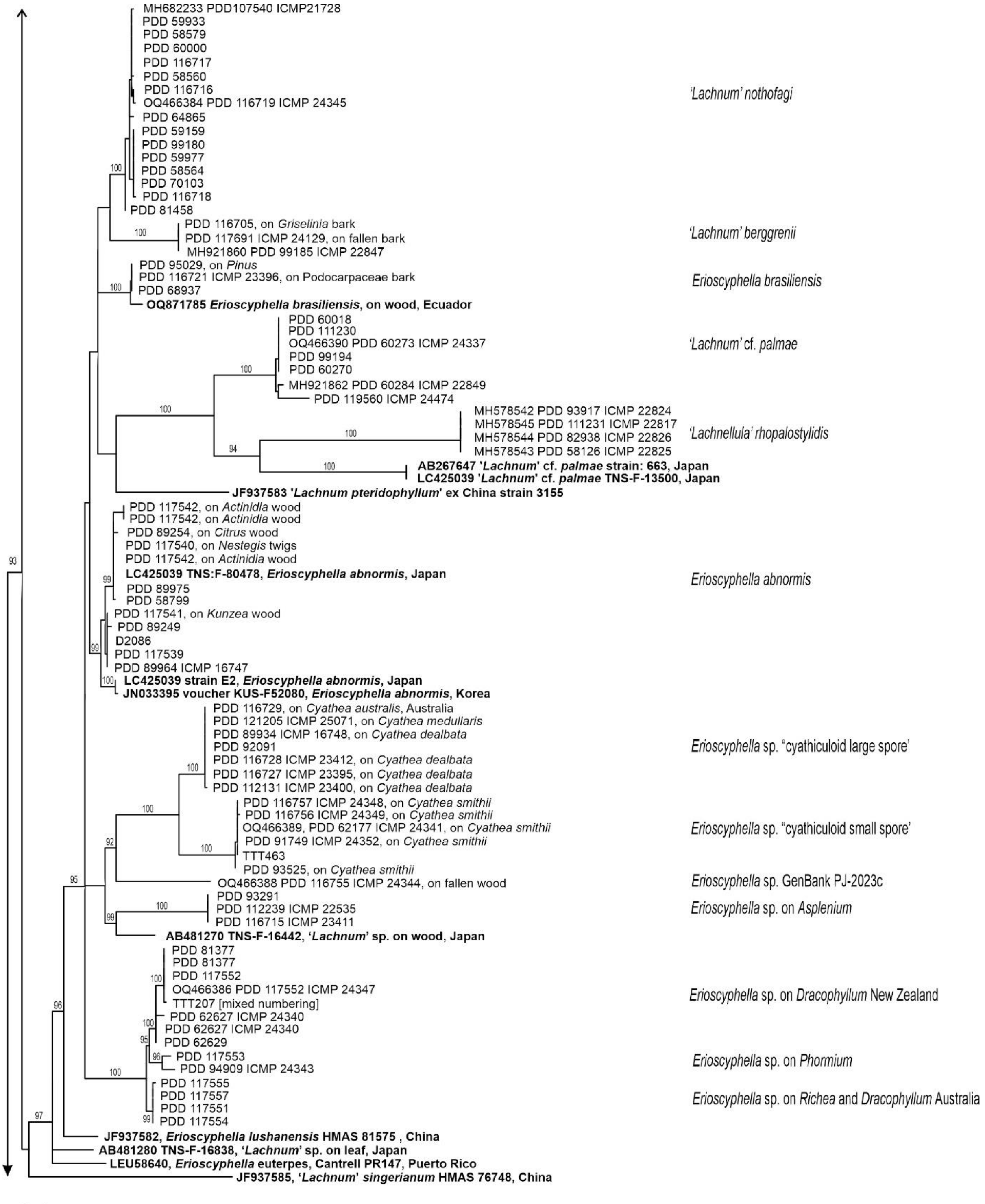
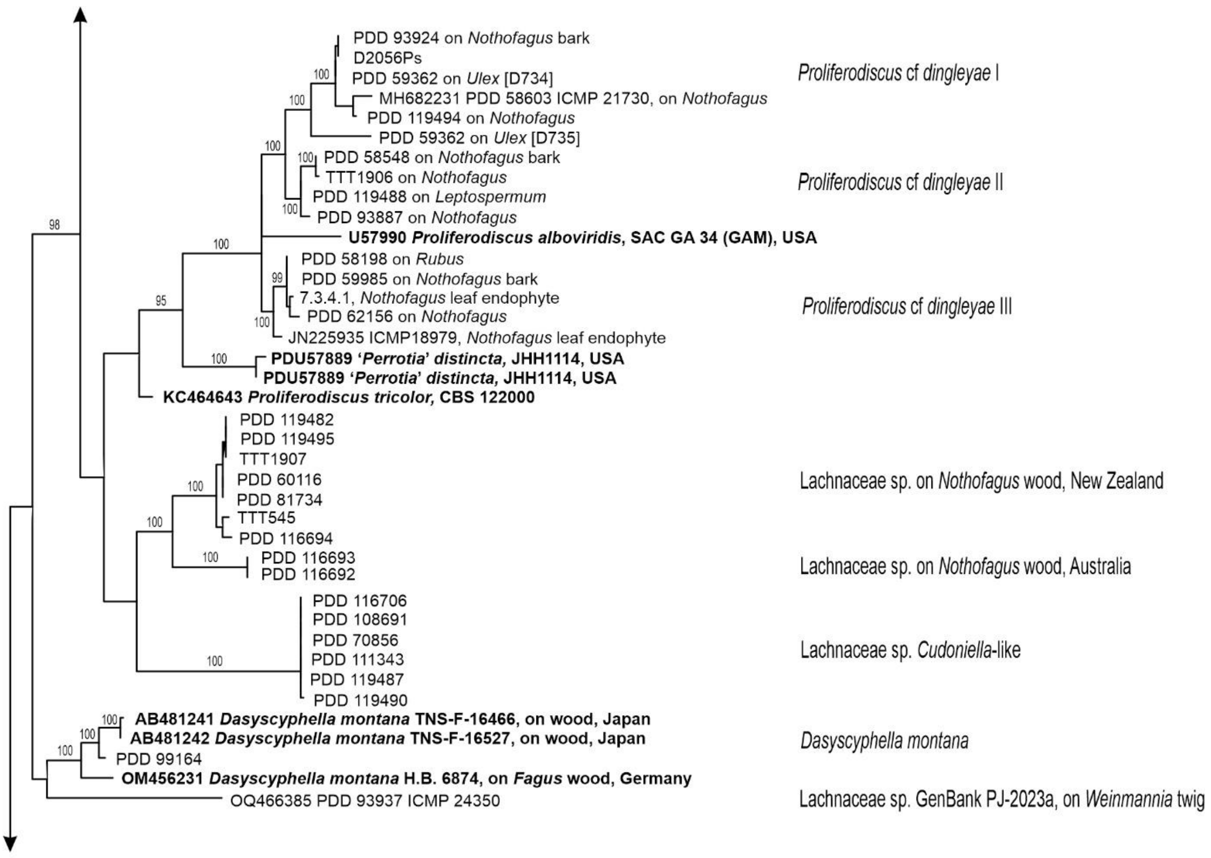

MH682233 PDD107540 ICMP21728
PDD 59933
PDD 58579
PDD 60000
PDD 116717
PDD 58560
PDD 116716
OQ466384 PDD 116719 ICMP 24345
PDD 64865
PDD 59159
PDD 99180
PDD 59977
PDD 58564
PDD 70103
PDD 116718
PDD 81458
'Lachnum' nothofagi
100
PDD 116705, on Griselinia bark
PDD 117691 ICMP 24129, on fallen bark
MH921860 PDD 99185 ICMP 22847
100
'Lachnum' berggrenii
PDD 95029, on Pinus
PDD 116721 ICMP 23396, on Podocarpaceae bark
PDD 68937
100
OQ871785 Erioscyphella brasiliensis, on wood, Ecuador
Erioscyphella brasiliensis
PDD 60018
PDD 111230
OQ466390 PDD 60273 ICMP 24337
PDD 99194
PDD 60270
MH921862 PDD 60284 ICMP 22849
PDD 119560 ICMP 24474
100
'Lachnum' cf. palmae
100
MH578542 PDD 93917 ICMP 22824
MH578545 PDD 111231 ICMP 22817
MH578544 PDD 82938 ICMP 22826
MH578543 PDD 58126 ICMP 22825
100
'Lachnellula' rhopalostylidis
94
100
AB267647 'Lachnum' cf. palmae strain: 663, Japan
LC425039 'Lachnum' cf. palmae TNS-F-13500, Japan
JF937583 'Lachnum pteridophyllum' ex China strain 3155
PDD 117542, on Actinidia wood
PDD 117542, on Actinidia wood
PDD 89254, on Citrus wood
PDD 117540, on Nestegis twigs
PDD 117542, on Actinidia wood
93
LC425039 TNS:F-80478, Erioscyphella abnormis, Japan
99
Erioscyphella abnormis
PDD 89975
PDD 58799
PDD 117541, on Kunzea wood
PDD 89249
D2086
99
PDD 117539
PDD 89964 ICMP 16747
100
LC425039 strain E2, Erioscyphella abnormis, Japan
JN033395 voucher KUS-F52080, Erioscyphella abnormis, Korea
PDD 116729, on Cyathea australis, Australia
PDD 121205 ICMP 25071, on Cyathea medullaris
PDD 89934 ICMP 16748, on Cyathea dealbata
PDD 92091
Erioscyphella sp. "cyathiculoid large spore'
100
PDD 116728 ICMP 23412, on Cyathea dealbata
PDD 116727 ICMP 23395, on Cyathea dealbata
PDD 112131 ICMP 23400, on Cyathea dealbata
PDD 116757 ICMP 24348, on Cyathea smithii
100
PDD 116756 ICMP 24349, on Cyathea smithii
OQ466389, PDD 62177 ICMP 24341, on Cyathea smithii
Erioscyphella sp. "cyathiculoid small spore'
92
PDD 91749 ICMP 24352, on Cyathea smithii
100
TTT463
PDD 93525, on Cyathea smithii
95
OQ466388 PDD 116755 ICMP 24344, on fallen wood
Erioscyphella sp. GenBank PJ-2023c
PDD 93291
100
PDD 112239 ICMP 22535
Erioscyphella sp. on Asplenium
99
PDD 116715 ICMP 23411
AB481270 TNS-F-16442, 'Lachnum' sp. on wood, Japan
PDD 81377
PDD 81377
100
PDD 117552
OQ466386 PDD 117552 ICMP 24347
Erioscyphella sp. on Dracophyllum New Zealand
96
TTT207 [mixed numbering]
100
PDD 62627 ICMP 24340
PDD 62627 ICMP 24340
95
PDD 62629
96
PDD 117553
Erioscyphella sp. on Phormium
PDD 94909 ICMP 24343
100
PDD 117555
PDD 117557
Erioscyphella sp. on Richea and Dracophyllum Australia
PDD 117551
97
99
PDD 117554
JF937582, Erioscyphella lushanensis HMAS 81575 , China
AB481280 TNS-F-16838, 'Lachnum' sp. on leaf, Japan
LEU58640, Erioscyphella euterpes, Cantrell PR147, Puerto Rico
JF937585, 'Lachnum' singerianum HMAS 76748, China

Fig 4


PDD 93924 on *Nothofagus* bark
D2056Ps
PDD 59362 on *Ulex* [D734]
MH682231 PDD 58603 ICMP 21730, on *Nothofagus*
PDD 119494 on *Nothofagus*
PDD 59362 on *Ulex* [D735]
PDD 58548 on *Nothofagus* bark
TTT1906 on *Nothofagus*
PDD 119488 on *Leptospermum*
PDD 93887 on *Nothofagus*
U57990 *Proliferodiscus alboviridis*, SAC GA 34 (GAM), USA
PDD 58198 on *Rubus*
PDD 59985 on *Nothofagus* bark
7.3.4.1, *Nothofagus* leaf endophyte
PDD 62156 on *Nothofagus*
JN225935 ICMP18979, *Nothofagus* leaf endophyte
PDU57889 '*Perrotia*' *distincta*, JHH1114, USA
PDU57889 '*Perrotia*' *distincta*, JHH1114, USA
KC464643 *Proliferodiscus tricolor*, CBS 122000
PDD 119482
PDD 119495
TTT1907
PDD 60116
PDD 81734
TTT545
PDD 116694
PDD 116693
PDD 116692
PDD 116706
PDD 108691
PDD 70856
PDD 111343
PDD 119487
PDD 119490
AB481241 *Dasyscyphella montana* TNS-F-16466, on wood, Japan
AB481242 *Dasyscyphella montana* TNS-F-16527, on wood, Japan
PDD 99164
OM456231 *Dasyscyphella montana* H.B. 6874, on *Fagus* wood, Germany
OQ466385 PDD 93937 ICMP 24350
Proliferodiscus cf *dingleyae* I
Proliferodiscus cf *dingleyae* II
Proliferodiscus cf *dingleyae* III
Lachnaceae sp. on *Nothofagus* wood, New Zealand
Lachnaceae sp. on *Nothofagus* wood, Australia
Lachnaceae sp. *Cudoniella*-like
Dasyscyphella montana
Lachnaceae sp. GenBank PJ-2023a, on *Weinmannia* twig
98
100
100
100
100
100
100
95
99
100
100
100
100
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100
100
100
100

Fig 5

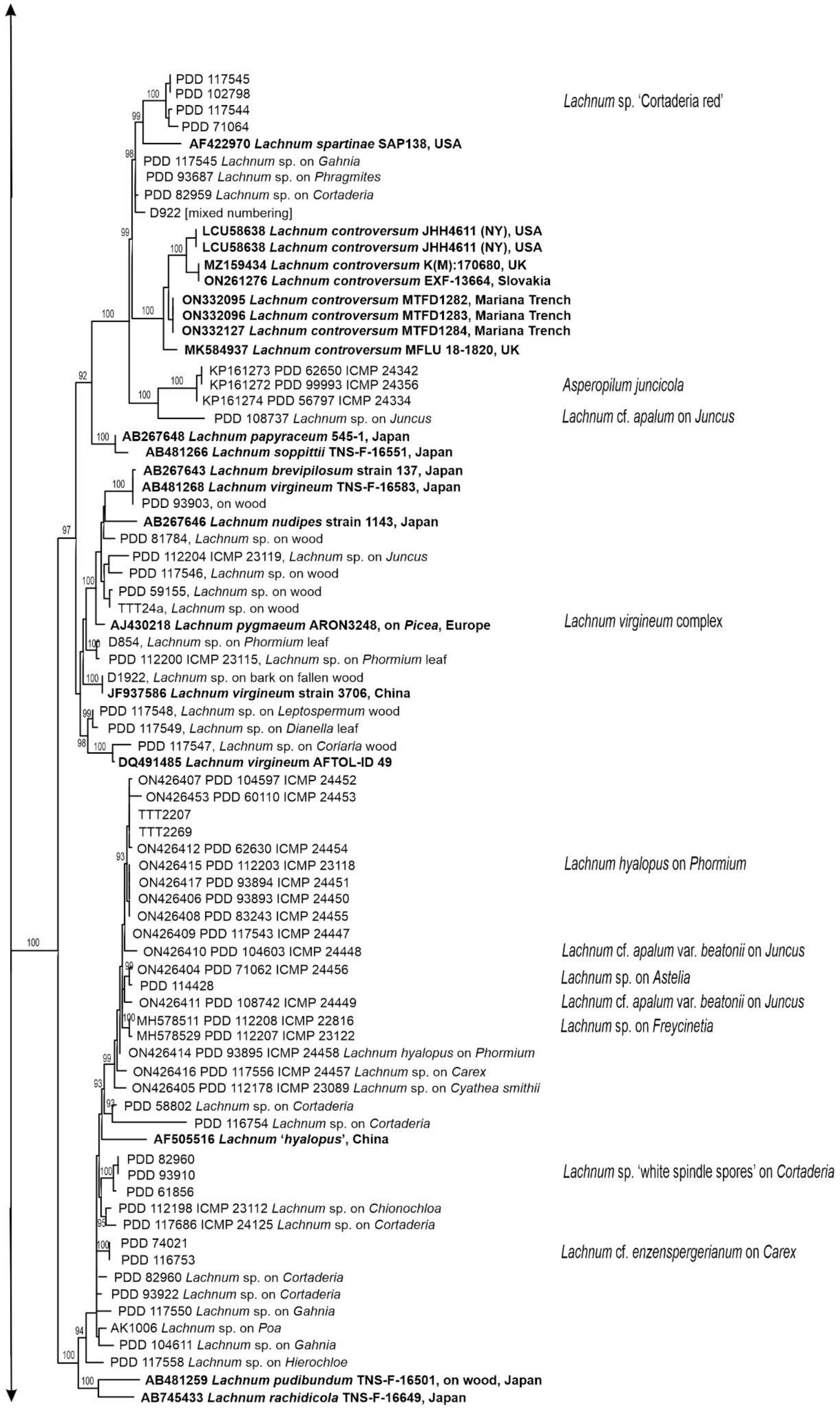
PDD 117545
PDD 102798
PDD 117544
PDD 71064
AF422970 Lachnum spartinae SAP138, USA
PDD 117545 Lachnum sp. on Gahnia
PDD 93687 Lachnum sp. on Phragmites
PDD 82959 Lachnum sp. on Cortaderia
D922 [mixed numbering]
LCU58638 Lachnum controversum JHH4611 (NY), USA
LCU58638 Lachnum controversum JHH4611 (NY), USA
MZ159434 Lachnum controversum K(M):170680, UK
ON261276 Lachnum controversum EXF-13664, Slovakia
ON332095 Lachnum controversum MTFD1282, Mariana Trench
ON332096 Lachnum controversum MTFD1283, Mariana Trench
ON332127 Lachnum controversum MTFD1284, Mariana Trench
MK584937 Lachnum controversum MFLU 18-1820, UK
KP161273 PDD 62650 ICMP 24342
KP161272 PDD 99993 ICMP 24356
KP161274 PDD 56797 ICMP 24334
PDD 108737 Lachnum sp. on Juncus
AB267648 Lachnum papyraceum 545-1, Japan
AB481266 Lachnum soppittii TNS-F-16551, Japan
AB267643 Lachnum brevipilosum strain 137, Japan
AB481268 Lachnum virgineum TNS-F-16583, Japan
PDD 93903, on wood
AB267646 Lachnum nudipes strain 1143, Japan
PDD 81784, Lachnum sp. on wood
PDD 112204 ICMP 23119, Lachnum sp. on Juncus
PDD 117546, Lachnum sp. on wood
PDD 59155, Lachnum sp. on wood
TTT24a, Lachnum sp. on wood
AJ430218 Lachnum pygmaeum ARON3248, on Picea, Europe
D854, Lachnum sp. on Phormium leaf
PDD 112200 ICMP 23115, Lachnum sp. on Phormium leaf
D1922, Lachnum sp. on bark on fallen wood
JF937586 Lachnum virgineum strain 3706, China
PDD 117548, Lachnum sp. on Leptospermum wood
PDD 117549, Lachnum sp. on Dianella leaf
PDD 117547, Lachnum sp. on Coriaria wood
DQ491485 Lachnum virgineum AFTOL-ID 49
ON426407 PDD 104597 ICMP 24452
ON426453 PDD 60110 ICMP 24453
TTT2207
TTT2269
ON426412 PDD 62630 ICMP 24454
ON426415 PDD 112203 ICMP 23118
ON426417 PDD 93894 ICMP 24451
ON426406 PDD 93893 ICMP 24450
ON426408 PDD 83243 ICMP 24455
ON426409 PDD 117543 ICMP 24447
ON426410 PDD 104603 ICMP 24448
ON426404 PDD 71062 ICMP 24456
PDD 114428
ON426411 PDD 108742 ICMP 24449
MH578511 PDD 112208 ICMP 22816
MH578529 PDD 112207 ICMP 23122
ON426414 PDD 93895 ICMP 24458 Lachnum hyalopus on Phormium
ON426416 PDD 117556 ICMP 24457 Lachnum sp. on Carex
ON426405 PDD 112178 ICMP 23089 Lachnum sp. on Cyathea smithii
PDD 58802 Lachnum sp. on Cortaderia
PDD 116754 Lachnum sp. on Cortaderia
AF505516 Lachnum 'hyalopus', China
PDD 82960
PDD 93910
PDD 61856
PDD 112198 ICMP 23112 Lachnum sp. on Chionochloa
PDD 117686 ICMP 24125 Lachnum sp. on Cortaderia
PDD 74021
PDD 116753
PDD 82960 Lachnum sp. on Cortaderia
PDD 93922 Lachnum sp. on Cortaderia
PDD 117550 Lachnum sp. on Gahnia
AK1006 Lachnum sp. on Poa
PDD 104611 Lachnum sp. on Gahnia
PDD 117558 Lachnum sp. on Hierochloe
AB481259 Lachnum pudibundum TNS-F-16501, on wood, Japan
AB745433 Lachnum rachidicola TNS-F-16649, Japan
Lachnum sp. 'Cortaderia red'
Asperopilum juncicola
Lachnum cf. apalum on Juncus
Lachnum virgineum complex
Lachnum hyalopus on Phormium
Lachnum cf. apalum var. beatonii on Juncus
Lachnum sp. on Astelia
Lachnum cf. apalum var. beatonii on Juncus
Lachnum sp. on Freycinetia
Lachnum sp. 'white spindle spores' on Cortaderia
Lachnum cf. enzenspergerianum on Carex
100
99
98
99
100
100
100
100
92
100
100
100
97
100
100
100
100
99
98
100
93
99
100
99
93
93
100
95
100
94
100
100
100

Fig 6

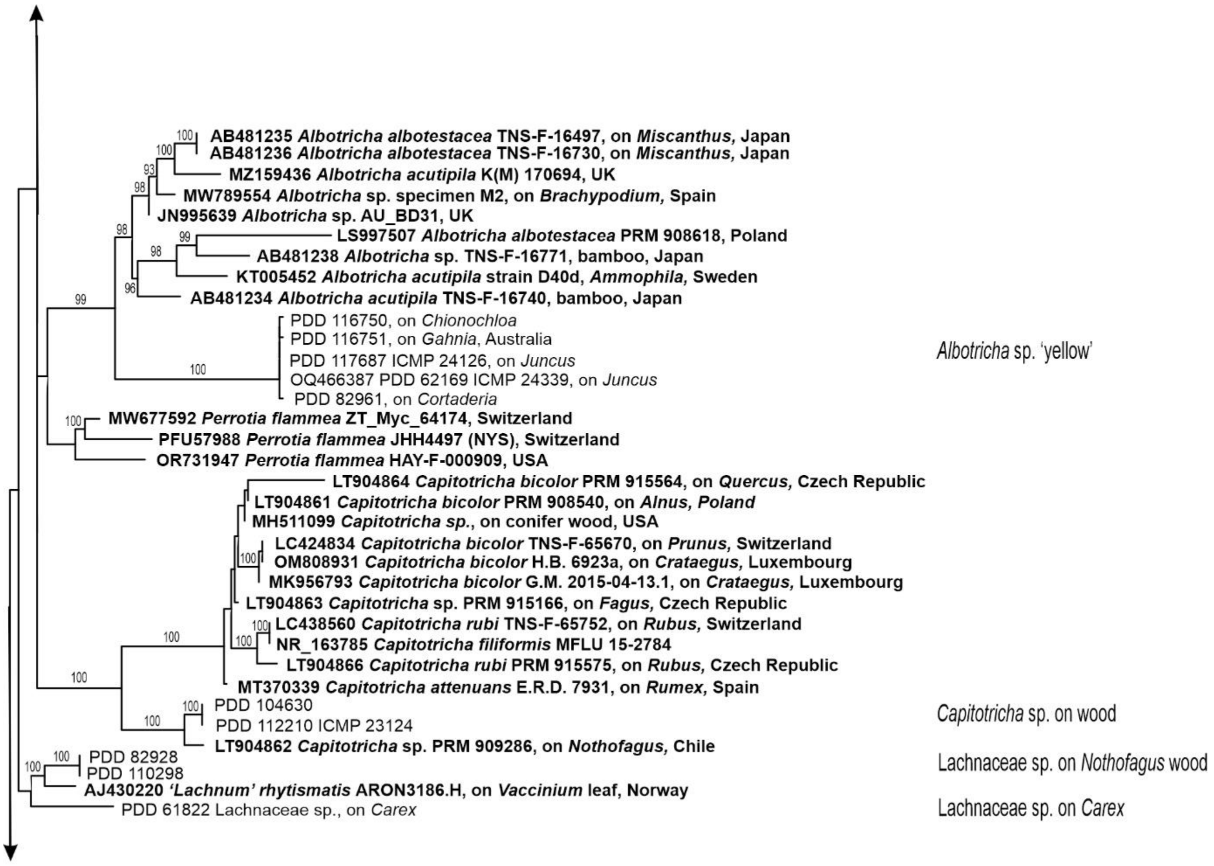
100
AB481235 Albotricha albotestacea TNS-F-16497, on Miscanthus, Japan
100
AB481236 Albotricha albotestacea TNS-F-16730, on Miscanthus, Japan
93
MZ159436 Albotricha acutipila K(M) 170694, UK
98
MW789554 Albotricha sp. specimen M2, on Brachypodium, Spain
JN995639 Albotricha sp. AU_BD31, UK
98
99
LS997507 Albotricha albotestacea PRM 908618, Poland
98
AB481238 Albotricha sp. TNS-F-16771, bamboo, Japan
KT005452 Albotricha acutipila strain D40d, Ammophila, Sweden
96
99
AB481234 Albotricha acutipila TNS-F-16740, bamboo, Japan
PDD 116750, on Chionochloa
PDD 116751, on Gahnia, Australia
100
PDD 117687 ICMP 24126, on Juncus
OQ466387 PDD 62169 ICMP 24339, on Juncus
PDD 82961, on Cortaderia
Albotricha sp. 'yellow'
100
MW677592 Perrotia flammea ZT_Myc_64174, Switzerland
PFU57988 Perrotia flammea JHH4497 (NYS), Switzerland
OR731947 Perrotia flammea HAY-F-000909, USA
LT904864 Capitotricha bicolor PRM 915564, on Quercus, Czech Republic
LT904861 Capitotricha bicolor PRM 908540, on Alnus, Poland
MH511099 Capitotricha sp., on conifer wood, USA
LC424834 Capitotricha bicolor TNS-F-65670, on Prunus, Switzerland
100
OM808931 Capitotricha bicolor H.B. 6923a, on Crataegus, Luxembourg
MK956793 Capitotricha bicolor G.M. 2015-04-13.1, on Crataegus, Luxembourg
LT904863 Capitotricha sp. PRM 915166, on Fagus, Czech Republic
100
LC438560 Capitotricha rubi TNS-F-65752, on Rubus, Switzerland
100
100
NR_163785 Capitotricha filiformis MFLU 15-2784
LT904866 Capitotricha rubi PRM 915575, on Rubus, Czech Republic
100
MT370339 Capitotricha attenuans E.R.D. 7931, on Rumex, Spain
100
PDD 104630
100
PDD 112210 ICMP 23124
Capitotricha sp. on wood
LT904862 Capitotricha sp. PRM 909286, on Nothofagus, Chile
100
PDD 82928
100
PDD 110298
Lachnaceae sp. on Nothofagus wood
AJ430220 'Lachnum' rhytismatis ARON3186.H, on Vaccinium leaf, Norway
PDD 61822 Lachnaceae sp., on Carex
Lachnaceae sp. on Carex

Fig 7

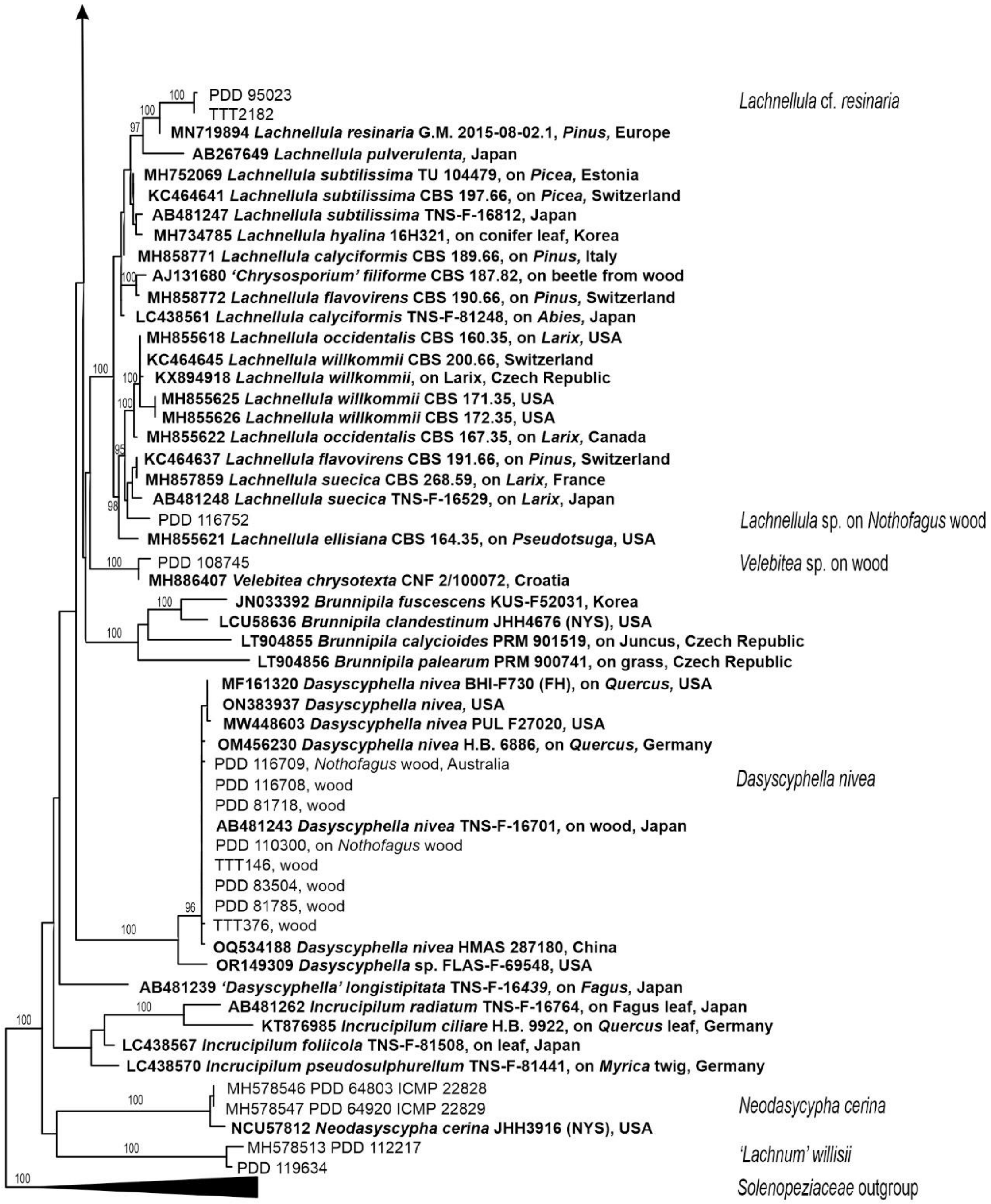
100
PDD 95023
100
TTT2182
97
MN719894 Lachnellula resinaria G.M. 2015-08-02.1, Pinus, Europe
AB267649 Lachnellula pulverulenta, Japan
MH752069 Lachnellula subtilissima TU 104479, on Picea, Estonia
KC464641 Lachnellula subtilissima CBS 197.66, on Picea, Switzerland
AB481247 Lachnellula subtilissima TNS-F-16812, Japan
MH734785 Lachnellula hyalina 16H321, on conifer leaf, Korea
MH858771 Lachnellula calyciformis CBS 189.66, on Pinus, Italy
100
AJ131680 'Chrysosporium' filiforme CBS 187.82, on beetle from wood
MH858772 Lachnellula flavovirens CBS 190.66, on Pinus, Switzerland
LC438561 Lachnellula calyciformis TNS-F-81248, on Abies, Japan
MH855618 Lachnellula occidentalis CBS 160.35, on Larix, USA
100
KC464645 Lachnellula willkommii CBS 200.66, Switzerland
100
KX894918 Lachnellula willkommii, on Larix, Czech Republic
100
MH855625 Lachnellula willkommii CBS 171.35, USA
MH855626 Lachnellula willkommii CBS 172.35, USA
MH855622 Lachnellula occidentalis CBS 167.35, on Larix, Canada
95
KC464637 Lachnellula flavovirens CBS 191.66, on Pinus, Switzerland
MH857859 Lachnellula suecica CBS 268.59, on Larix, France
98
AB481248 Lachnellula suecica TNS-F-16529, on Larix, Japan
PDD 116752
MH855621 Lachnellula ellisiana CBS 164.35, on Pseudotsuga, USA
100
PDD 108745
MH886407 Velebitea chrysotexta CNF 2/100072, Croatia
100
JN033392 Brunnipila fuscescens KUS-F52031, Korea
100
LCU58636 Brunnipila clandestinum JHH4676 (NYS), USA
LT904855 Brunnipila calycioides PRM 901519, on Juncus, Czech Republic
LT904856 Brunnipila palearum PRM 900741, on grass, Czech Republic
MF161320 Dasyscyphella nivea BHI-F730 (FH), on Quercus, USA
ON383937 Dasyscyphella nivea, USA
MW448603 Dasyscyphella nivea PUL F27020, USA
OM456230 Dasyscyphella nivea H.B. 6886, on Quercus, Germany
PDD 116709, Nothofagus wood, Australia
PDD 116708, wood
PDD 81718, wood
AB481243 Dasyscyphella nivea TNS-F-16701, on wood, Japan
PDD 110300, on Nothofagus wood
TTT146, wood
PDD 83504, wood
PDD 81785, wood
96
TTT376, wood
100
OQ534188 Dasyscyphella nivea HMAS 287180, China
OR149309 Dasyscyphella sp. FLAS-F-69548, USA
AB481239 'Dasyscyphella' longistipitata TNS-F-16439, on Fagus, Japan
100
AB481262 Incrucipilum radiatum TNS-F-16764, on Fagus leaf, Japan
100
KT876985 Incrucipilum ciliare H.B. 9922, on Quercus leaf, Germany
LC438567 Incrucipilum foliicola TNS-F-81508, on leaf, Japan
LC438570 Incrucipilum pseudosulphurellum TNS-F-81441, on Myrica twig, Germany
MH578546 PDD 64803 ICMP 22828
100
MH578547 PDD 64920 ICMP 22829
NCU57812 Neodasyscypha cerina JHH3916 (NYS), USA
100
MH578513 PDD 112217
PDD 119634
100
Lachnellula cf. resinaria
Lachnellula sp. on Nothofagus wood
Velebitea sp. on wood
Dasyscyphella nivea
Neodasycypha cerina
'Lachnum' willisii
Solenopeziaceae outgroup

Fig 8