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The lichen order *Caliciales* in Calabria (S. Italy)

Abstract

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Thirty-five species of *Caliciales* (lichenized *Ascomycetes*) are reported from Calabria (S. Italy). The following genera are represented: *Calicium, Chaenotheca, Chaenothecopsis, Cyphelium, Microcalicium, Mycocalicium, Sclerophora, Sphaerophorus* and *Sphinctrina.* Seventeen taxa are new to Calabria; two, *Chaenotheca brachypoda* and *Chaenothecopsis treicheliana,* are new to Italy. Distribution maps for Calabria are provided, and the ecology of each species is discussed.

Introduction

Until recently, Calabria, the southernmost part of the Italian mainland,was one of the lichenologically least known regions of Italy.

The first floristic records from Calabria are contained in a series of papers by Jatta (1874, 1875, 1880, 1882, 1885, 1886, 1889), devoted to the lichens of southern Italy and two brief papers by Solla (1896) and Micheletti (1897). Trotter (1911), Gavioli (1934), Albo (1935) and Agostini (1963) give an uninteresting list, and it is only after the foundation of the Italian Lichen Society, in 1987, that lichenological studies in Calabria started to realy develop trough the activity of researchers at the Botanical Institute of the University of Cosenza. Presently, the University hosts a rapidly growing lichen herbarium (Codogno & Puntillo 1990) and several Italian and foreign lichenologists have visited the region in connection with exscursions organized by the Italian Lichen Society.

A recent contribution to the lichen flora of Calabria was published by Puntillo (1987); several new records are also given by Boom & Aptroot (1990) and Bartoli & al. (1991). Lists of *Umbilicariaceae* and *Pannariaceae* from Calabria are given in Codogno & Puntillo (1989, 1991).

According to Nimis (1993), the total number of lichen species known from Calabria is 629, a figure wich will certainly increase cosiderably in the future.

Caliciales have received little attention by lichenologist in Southern Italy, and only a few species have been reported from Calabria. Jatta (1889) mentioned only two species, *Spaerophoron coralloides* (Pers.) Fr. and *Sphinctrina turbinata* (Fr.) Koerb. Puntillo (1987) published a list of 14 *Caliciales* from Calabria; in a recent overwiew on the *Caliciales* of Italy, including a key and a list of synonyms (Puntillo 1989), further four species were recorded, bringing the total to 19.

The present paper, wich summarizes 8 years of field work, provides a complete catalogue of all 35 species of *Caliciales* now known from Calabria, with distribution maps and notes on their ecology.

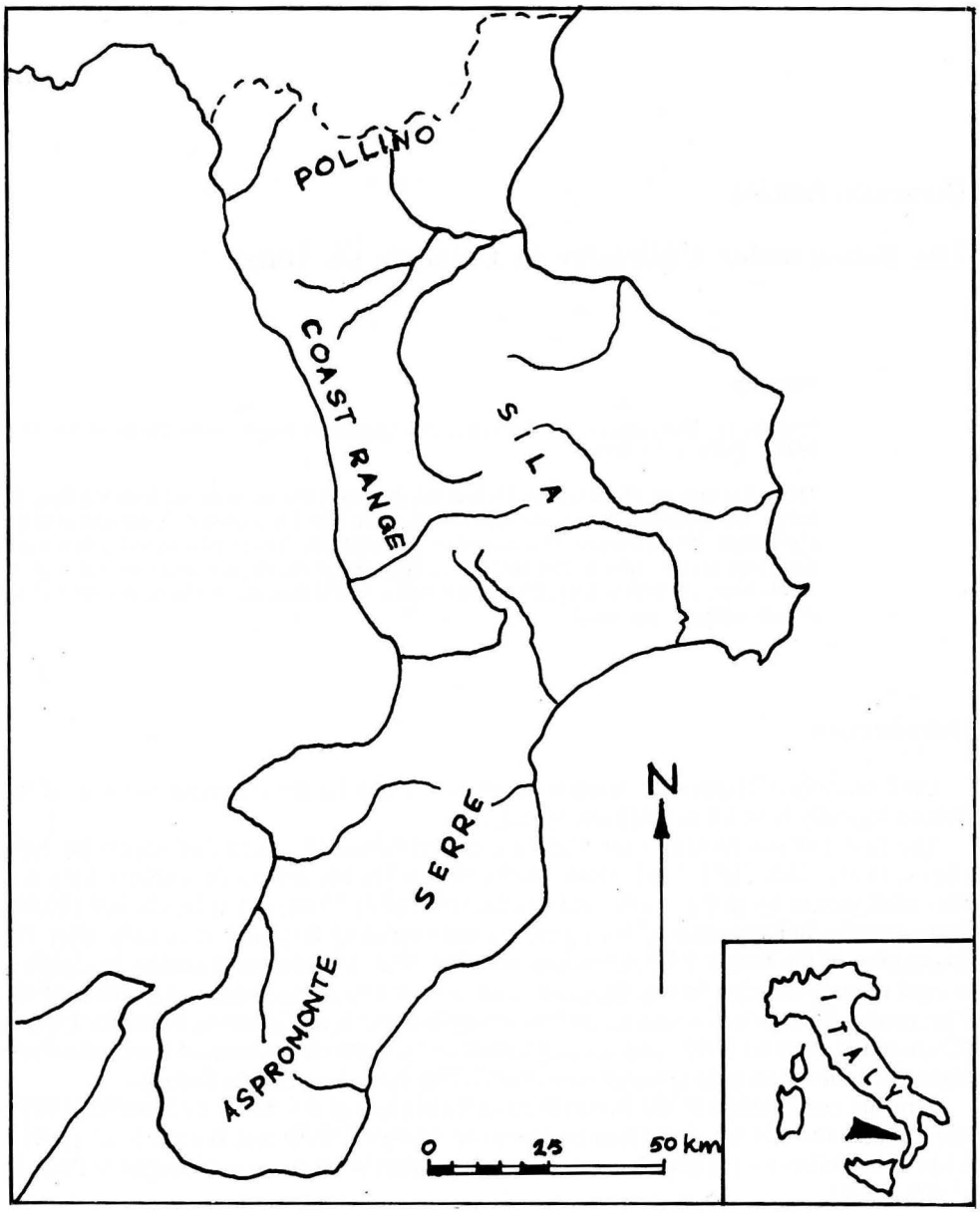

Fig. 1. Map of the survey area.

Survey area

Calabria (Fig. 1) is 250 km long and up to 100 km broad. It lies between the Tyrrhenian and Ionian seas with 91 % of its territory occupied by mountains. The most important mountains are (Fig. 1): Mt. Pollino (2267 m), Coastal Range (1541 m), Sila Massif (1928 m), Serre Mts. (1423 m) and Aspromonte Massif (1955). Mt. Pollino and a small part of the Coastal Range (Mt. Cocuzzo) are calcareous, whereas the other mountains are mainly siliceous, with igneous or metamorphic rocks, (Ogniben 1973).
The Mediterranean climate of Calabria is characterized by a humid winter season (Ciancio 1971) though with a broad range of variation related to altitude and aspect (Fig. 2

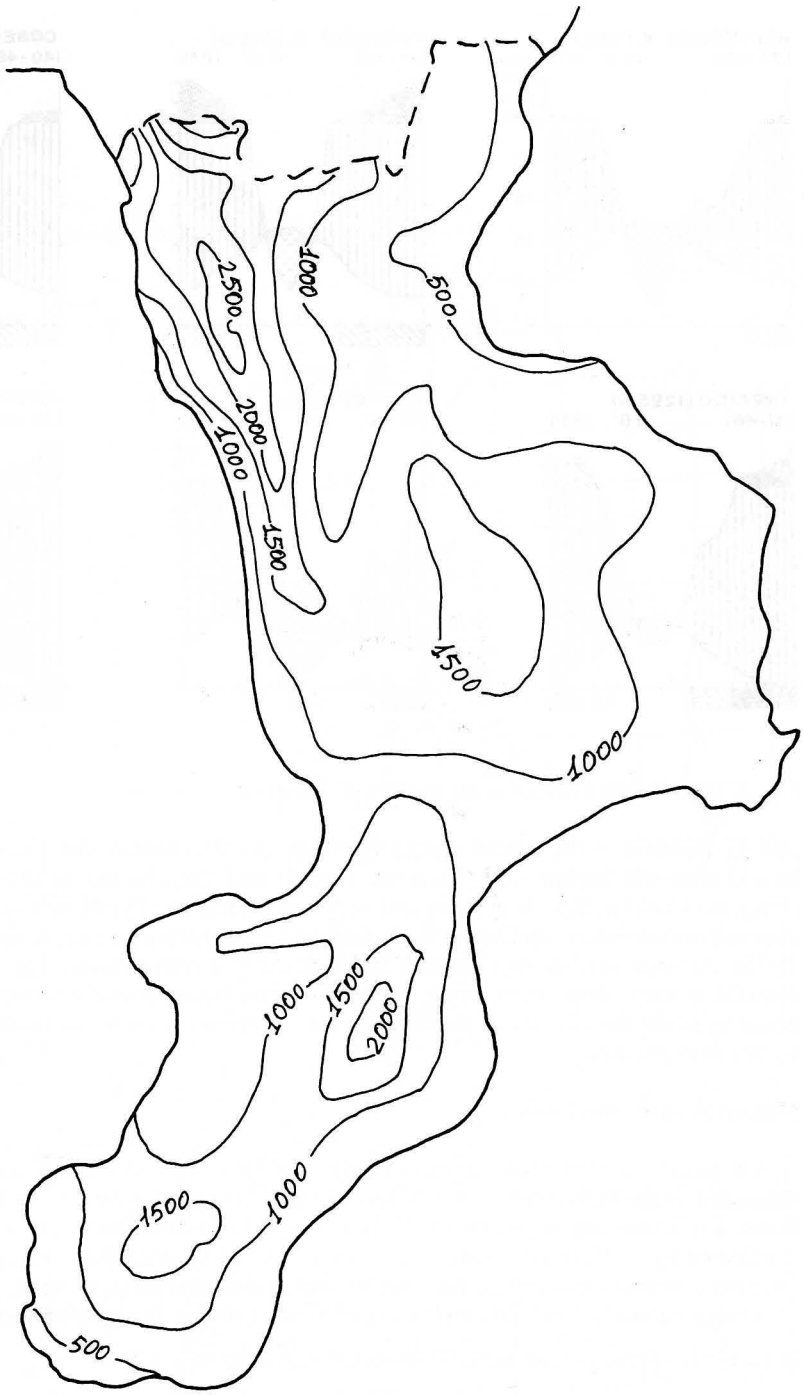

Fig. 2. Map of Calabria with isohyetes (Caloiero, 1975).

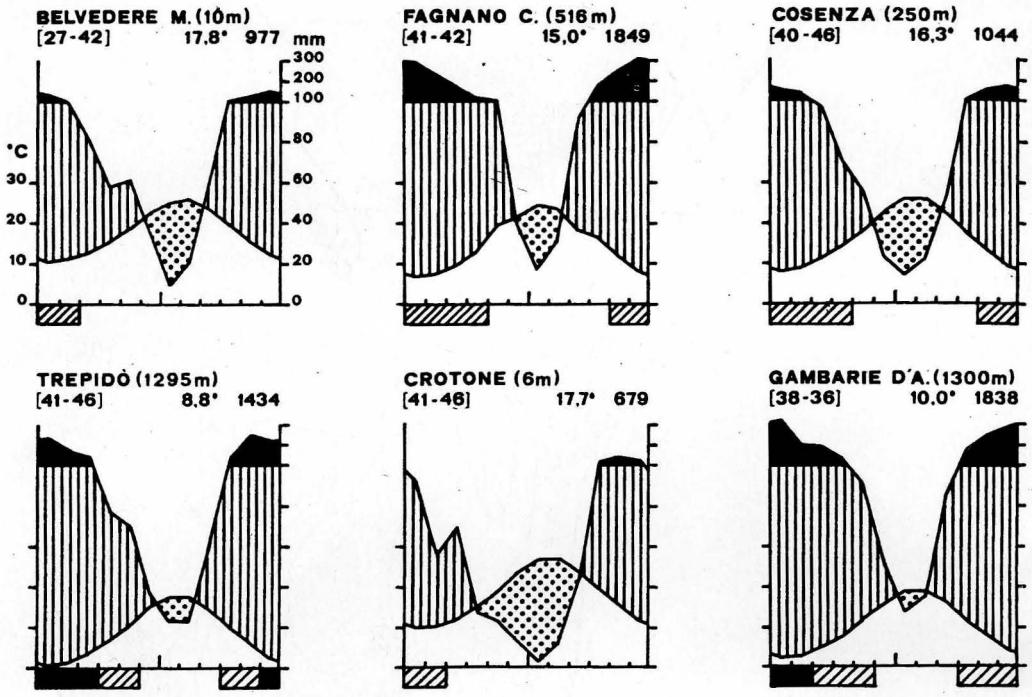

Fig. 3. Climatic diagrams of some stations in Calabria.

and 3). Because of the humid westernly winds, the Tyrrhenian side (Belvedere) is more humid than the Ionian side (Crotone, Fig. 3) and the climate of the Coastal Range (Fagnano Castello, Fig. 3) is warm and very rainy. Here the Tyrrhenian sea produces high atmospheric moisture, and sometimes abundant precipitations, ever in summer (Caloiero 1975). At high elevations (Trepidò and Gambarie d'Aspromonte, Fig. 3) the summer drought is very short; the climate of Aspromonte (Gambarie d'Aspromonte, Fig. 3) is oceanic, while the climate of the Sila Massif (Trepidò) is more continental, with longer winter frost periods.

Material and methods

All specimens examined (approximately 2,OOO) were collected by the author and are deposited in the herbarium of the Botanical Garden of the University of Calabria (CLU). Some duplicates are deposited in TSB and in UPS. Some other specimens have been distributed by A. Vèzda (*Lichenes selecti exsiccati*). Field work was carried out in Calabria over eight years (1984-1992). The sites of collection are shown in Fig. 4.

Nomenclature follows Tibell (1987) and Nimis (1993). The distribution of each species in Calabria is ped by map with UTM-based grid units of 5 x 5 km^2.

Enumeration of species

Calicium abietinum Pers. in Tent. Disp. Meth. Fung. Suppl.: 59. 1797.
Distribution and ecology. - *Calicium abietinum* is widely distributed in the northern hemisphere, (Europe, Asia and North America); in the southern hemisphere it has been

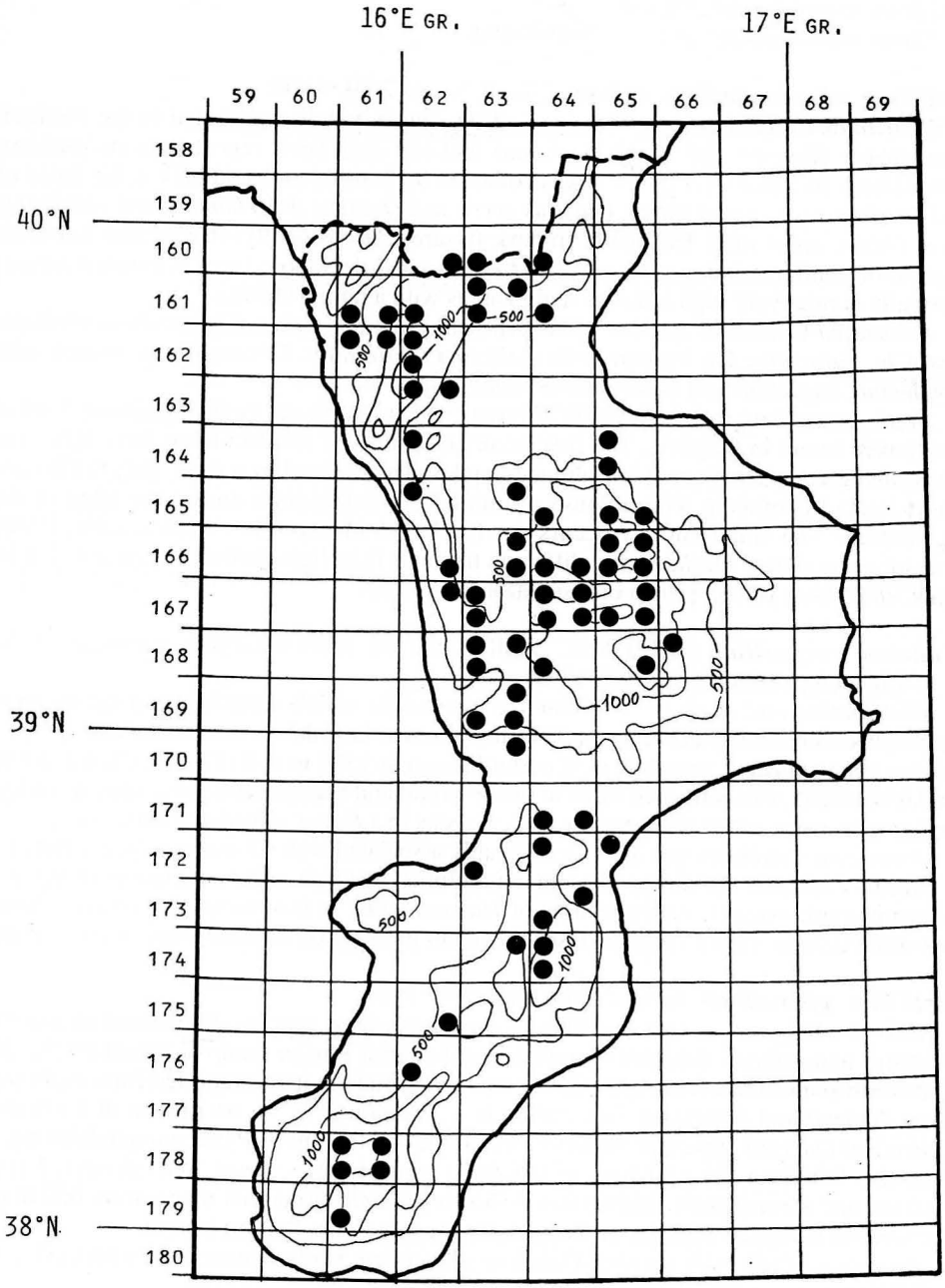

Fig.4. Sites of collection of *Caliciales* species in Calabria. Isohypses are reported (500 m).

reported from the cool to the temperate areas of Australia, New Zeland, Africa and South America. In Calabria, *C. abietinum* has been collected twice, both times on decorticated and decomposed lignum (Fig. 5).

Associated Caliciales species. - None found.

Calicium adspersum Pers. in Icon. Descr. Fung. 2:59. 1800.

Distribution and ecology. - *Calicium adspersum* is widely distributed in the northern hemisphere (Europe and North America) and has also been reported from southern hemisphere. In Calabria (Fig. 5), it was collected on fissured and acid bark at the bases of old deciduous (*Castanea sativa*, *Quercus cerris* and *Quercus dalechampii*) and coniferous trees (*Abies alba*) most frequently in bark fissures. Occasionally, it was also found on lignum of conifers (*Abies alba* and *Pinus laricio*) and deciduous trees (*Castanea sativa*) normally at relatively high altitudes and in areas with a humid climate.

Associated Caliciales species. - On bark with *Calicium viride*, *Chaenotheca trichialis* and *Ch. chlorella*. On lignum with *Calicium salicinum*, *Chaenotheca brunneola*, *Cyphelium inquinans* and *Mycocalicium subtile*.

Note. - According to Tibell (1975: 72) two distinct morph can be distinguished, both of wich were found in Calabria. The first occurs on trunks of old deciduous trees (*Quercus cerris* and *Castanea sativa*) at low altitudes, and is characterized by a thick, grey thallus and short-stalked apothecia with a dense pruina on the mazaedium and at the edge of the excipulum. The other morph occurs on trunks of old conifers (*Abies alba, Pinus leucodermis*) at high altitudes, and differs in having a thin, light thallus, a logn and slender stalk, and a faint yellow pruina on the mazaedium alone.

Calicium corynellum (Ach.) Ach., Meth. Lich.: 94. 1803 ≡ *Lichen corynellus* Ach., Lichenogr. Suec. Prodr.: 85. 1798.

Distribution and ecology - *Calicium corynellum* is widely distributed in the northern hemisphere, occurring in Europe and North America. In Calabria it is rather rare (Fig. 6), having been collected from 650 m (Coastal Range) to 1350 m (Sila Grande). It was found under overhang, siliceous rock faces in rather humid and shaded situations, often in valleys and gorges. Once it was collected on vertical rocks in a *Fagus sylvatica* forest.

Associated Caliciales species. - Occasionally associated with *Chaenothecopsis exserta*.

Note. - *Calicium corynellum* has an autonomous greenish-yellow thallus growing as a parasimbiontic-parasite on the thallus of *Haematomma ochroleucum* and other leprose-sorediose lichens. I have found also specimen not growing on *Haematomma ochroleucum*.

Calicium glaucellum Ach., Meth. Lich.: 97. 1803.

Distribution and ecology. - This is a cosmopolitan species distributed in the the northern hemisphere, frequent in northern and central Europe (map in Tibell 1975: 28), and North and Central America; in the southern hemisphere it was reported from Australia, New Zealand and Argentina. In Calabria it is common (Fig. 7), on lignum of *Castanea sativa* and *Quercus* spp., and has once been found on lignum of Pyrus amygdaliformis. It was also found on the acid bark of conifers (*Pinus laricio*, *Pinus leucodermis*, *Taxus baccata* and *Metasequoia sempervirens*) showing a wide altitudinal range, from 650 m on the Coastal Range to 2000 m, on Serra delle Ciavole in the Pollino Massif.

Associated Caliciales species.-*Calicium glaucellum* is often associated with *Calicium salicinum*.

Calicium quercinum Pers., Tent. Disp. Meth. Fung.: 59. 1797.

Distribution and ecology. - The European distribution of this species goes from southern Scandinavia to the Mediterranean mountains. In Calabria (Fig. 9) it was collected

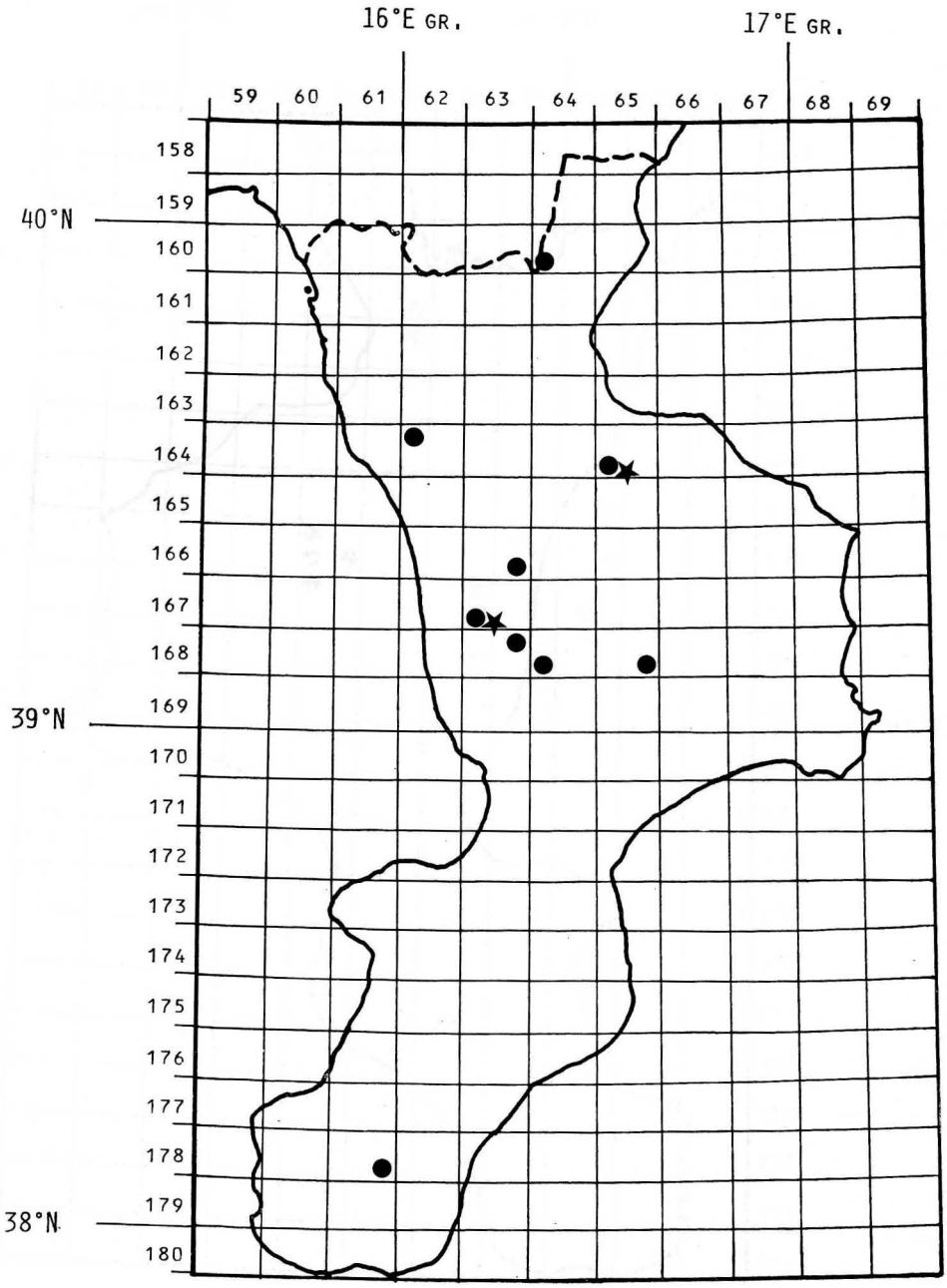

Fig.5. Distribution of *Calicium abietinum* (stars) and *Calicium adspersum* (cirles) in Calabria.

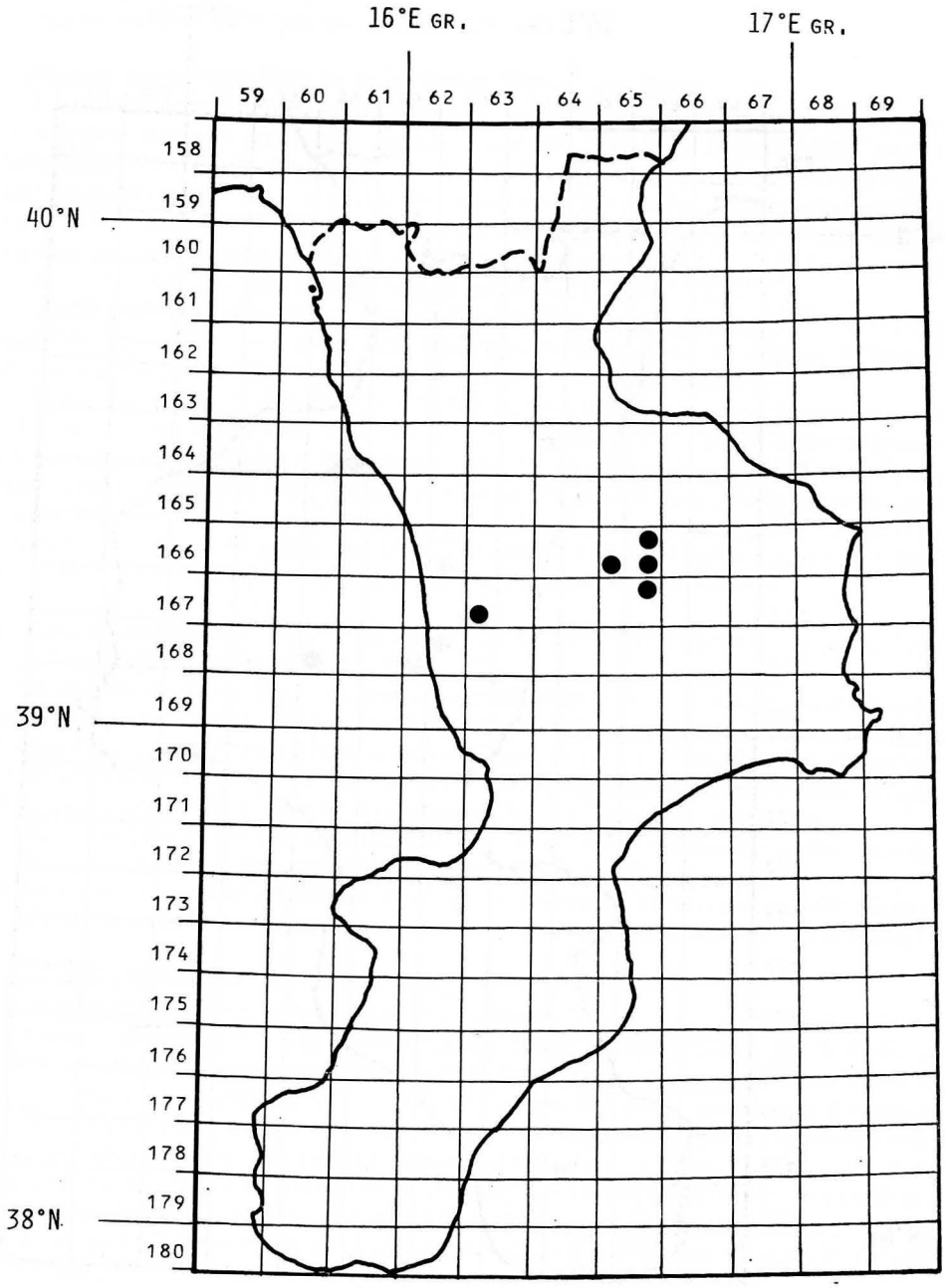

Fig. 6. Distribution of *Calicium corynellum* in Calabria.

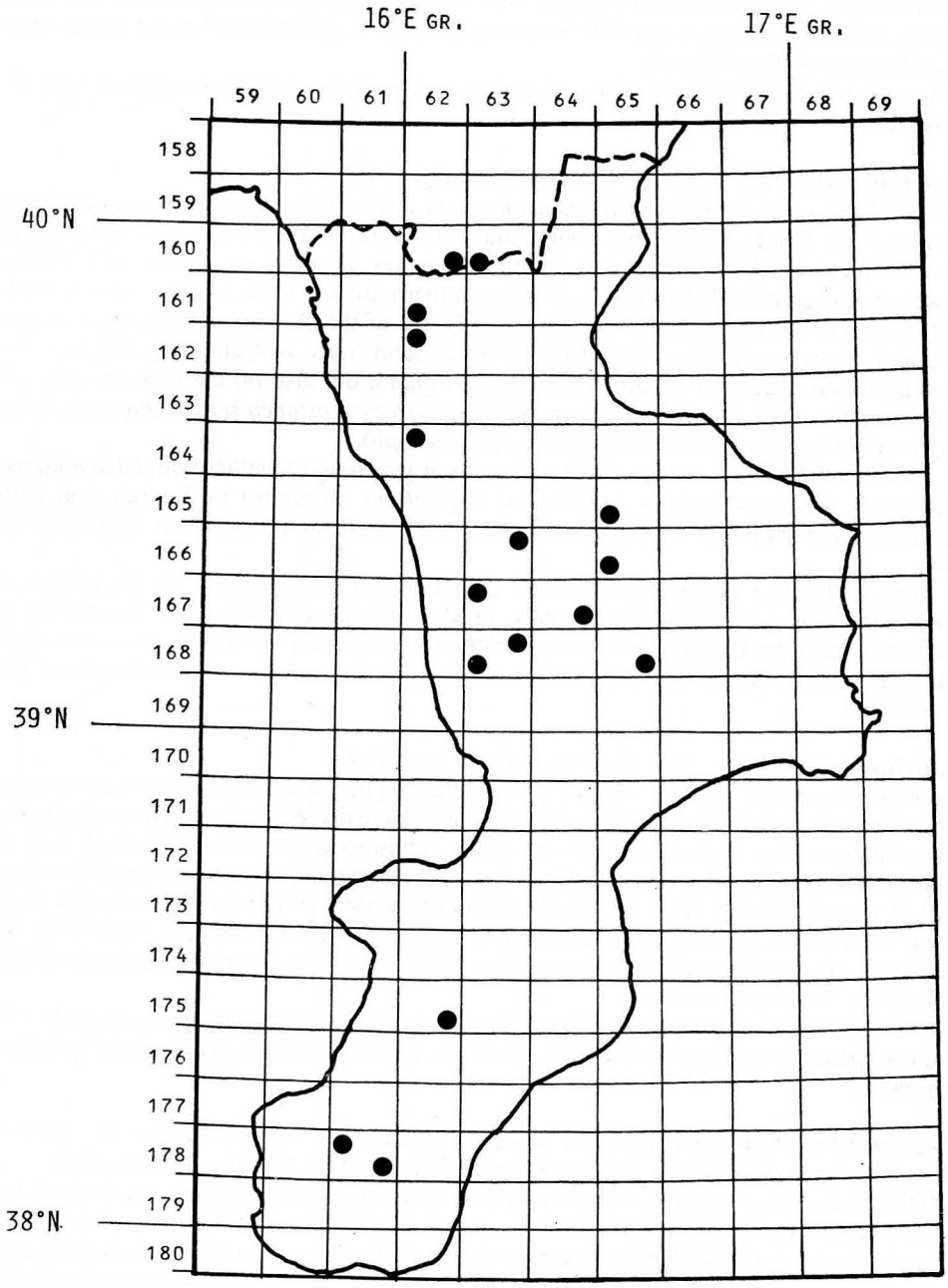

Fig. 7. Distribution of *Calicium glaucellum* in Calabria.

only on lignum of deciduous trees (*Castanea sativa* and *Quercus* spp.), and, has once been found, on lignum of *Pyrus amygdaliformis*. It was also found on the acid bark of conifers (*Pinus laricio*, *Pinus leucodermis*, *Taxus baccata* and *Metasequoia sempervirens*) showing a wide altitudinal range, from 650 m on the Coastal Range to 2000 m on Serra delle Ciavole in the Pollino Massif.

Associated Caliciales species. - *Calicium glaucellum* is often associated with *C. salicinum*.

Calicium salicinum Pers. in Ann. Bot. (Usteri), 7: 20. 1794

Distribution and Ecology. - *Calicium salicinum* is a cosmopolitan species occurring in Europe, Asia, North, Central and South America, Australasia and Africa. In Europe it is most frequent in the temperate and hemiboreal zones; it grows on lignum of conifers; however, according to Tibell (1975: 30), in southern areas it tends to grow also on bark and lignum of deciduous trees. In Calabria it is one of the commonest species (Pollino, Sila and Aspromonte Massives , Coastal Range and Serre of Catanzaro, see Fig. 8). Usually it was found on slightly decomposed lignum, but also on the bark of very old conifers (*Abies alba*, *Taxus baccata*) and deciduous trees (*Castanea sativa*, *Quercus cerris*, *Fagus sylvatica*, *Alnus cordata* and *Quercus dalechampii*).

Associated Caliciales species. - Occasionally it was found together with *Chaenotheca brunneola*, *Chaenothecopsis pusiola* and *Cyphelium inquinans* on lignum, and with *Calicium adspersum*, *C. viride*, *Chaenothecopsis debilis* and *Cyphelium inquinans* on bark.

Note. - This is a polymorphic species. According to Tibell (1975: 77) the apothecia sometimes have a long and slender stalk, or also may be almost sessile. The thallus is very thick when growing on the bark of deciduous trees, while it is totally immersed when on lignum of conifers. Some populations have a whitish pruina on the lower part of the capitulum.

Calicium viride Pers. Ann. Bot. (Usteri), 7: 20. 1794.

Distribution and ecology. - In the northern hemisphere *Calicium viride* was reported from North America and Europe; for the southern hemisphere it is known from Argentina (unpublished data). In Calabria it is one of the commonest species on the rough bark of conifers (*Abies alba*, *Pinus laricio*, *Pinus leucodermis* and *Larix decidua*) in the montane belt. It was also found, more rarely, on lignum of conifers (*Pinus laricio*), and still more rarely on the bark of old deciduous trees (*Castanea sativa*), from 1100 to 1760 m (Fig. 9). Normally this species is confined to conifer woodlands; it was found in deciduous forests only twice. New to Calabria.

Associated Caliciales species. - It was found together with *Chaenotheca chlorella*, *Ch. crhysocephala*, *Ch. phaeocephala*, *Ch. trichialis*, *Chaenothecopsis debilis* and *Cyphelium inquinans*.

Chaenotheca brachypoda (Ach.) Tibell in Symb. Bot. Upsal., 27 (1): 71. 1987. ≡ *Coniocybe brachypoda* Ach., in Kungl. Vetensk.-Akad. Nya Handl.: 287. 1816.

Distribution and ecology. - *Chaenotheca brachypoda* is a frequently overlooked, but widely distributed, probably cosmopolitan species. It is known from Europe and Argentina (unpublished data). In Calabria it usually occurs on the decomposed lignum of deciduous trees (*Fagus sylvatica* and *Quercus ilex*), but it was also found on bark of old coniferous trees (*Abies alba*) in shaded and humid situations on high mountains (up to 1200 m). It is most frequent in cool-temperate forests, in areas with high precipitations (Fig. 10).

Associated Caliciales species. - In most collections it was associated with *Chaenotheca furfuracea*, *Ch. chlorella*, *Ch. trichialis*, *Calicium viride*, *Sclerophora peronella* and

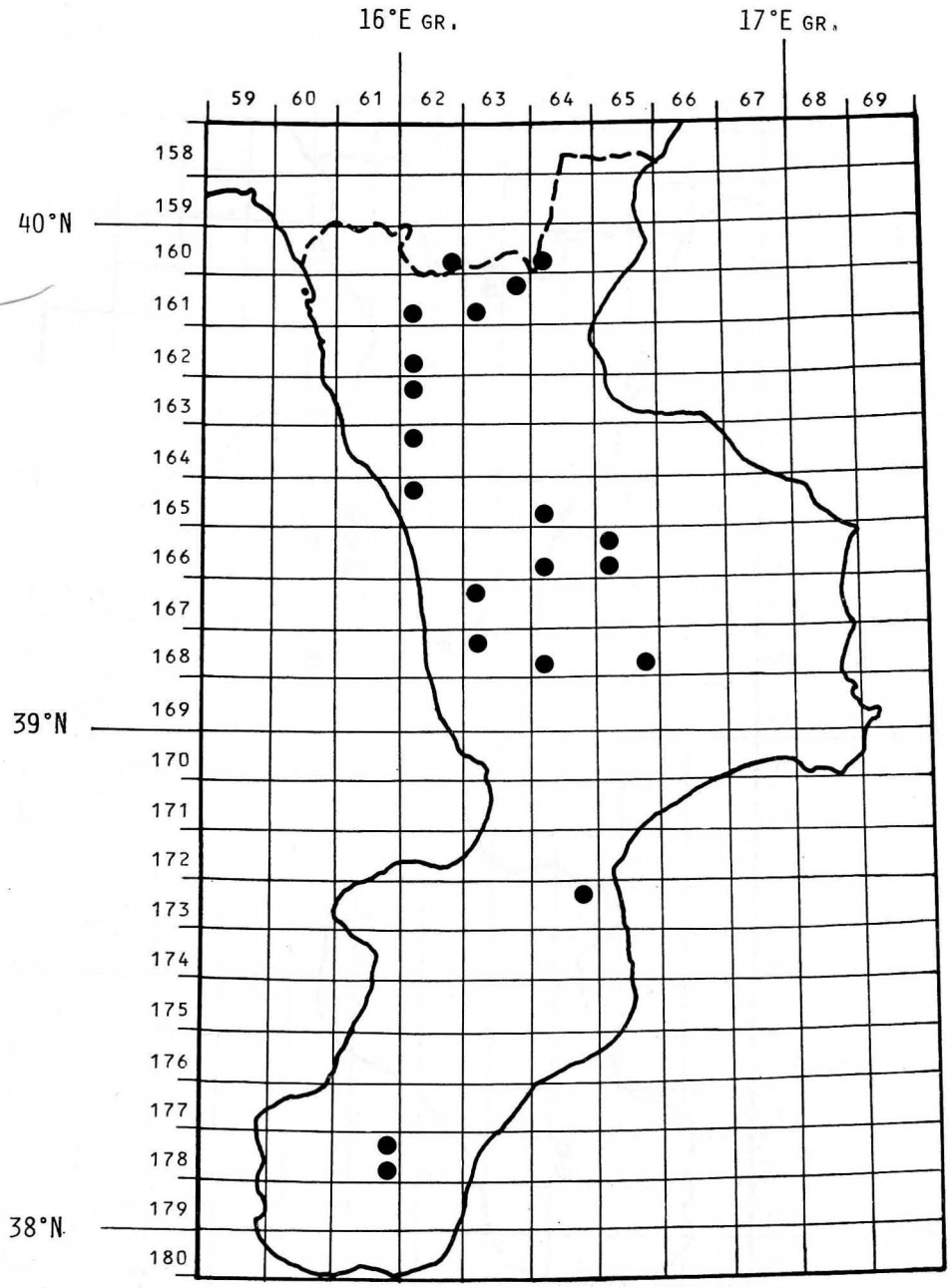

Fig. 8. Distribution of *Calicium salicinum* in Calabria.

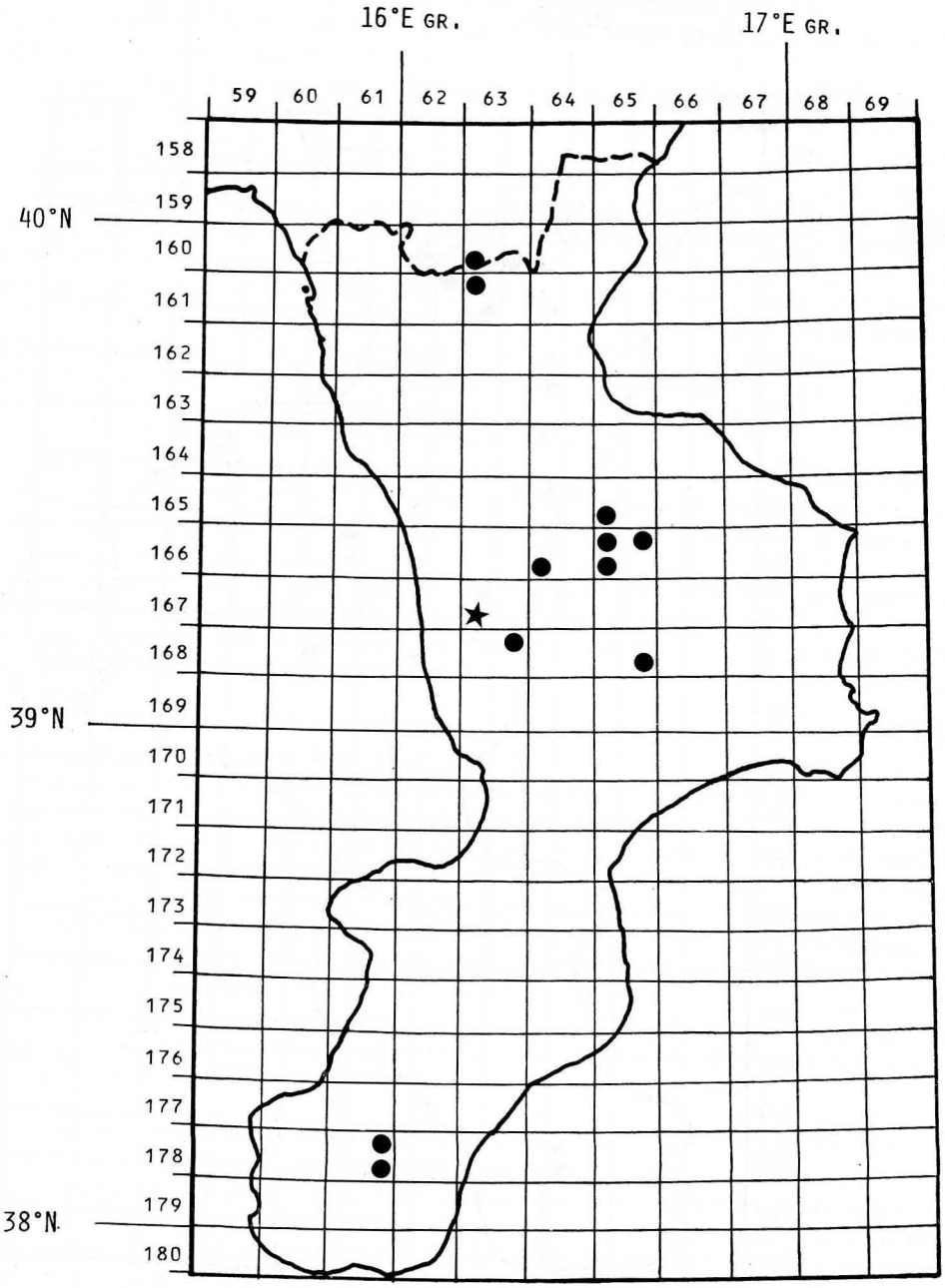

Fig. 9. Distribution of *Calicium quercinum* (stars) and *Calicium viride* (circles) in Calabria.

Chaenothecopsis debilis on the bark of old conifers *Abies alba*. Normally it grows on lignum of decidous trees, with no associated species.

Chaenotheca brunneola (Ach.) Müll. Arg. in Mém. Soc. Phys. Hist. Nat. Genève 16, (2): 360. 1862. ≡ *Calicium brunneolum* Ach. in Kungl. Vetensk.-Akad. Nya Handl.: 279. 1816.

Distribution and ecology. - *Chaenotheca brunneola* is a cosmopolitan species with a very wide distribution in the northern hemisphere, occurring in the northern Boreal-Temperate zones (Europe, Asia, North, Africa; Tibell 1980: 24); in the southern hemisphere it is known from South America and New Zealand. In Calabria it was found on well-decomposed lignum in shaded and humid situations, in the mountains, often in mixed beech-fir stands, on the lignum of *Abies alba* and *Fagus sylvatica* . Occasionally, it was also collected on lignum of *Pinus laricio* and of *Castanea sativa* at low altitudes. The distribution map is in Fig. 11.

Associated Caliciales species. - *Chaenotheca brunneola* often occurs with *Calicium adspersum*, *C. salicinum*, *Chaenothecopsis pusiola* and *Cyphelium inquinans* on lignum. Once it was found on bark of *Pinus laricio*, with *Calicium glaucellum*.

Chaenotheca chlorella (Ach.) Müll. Arg. in Mém. Soc. Phys. Hist. Nat. Genève, 16: 360. 1862. ≡ *Calicium chlorellum* Ach., Meth. Lich.: 95. 1803.

Distribution and ecology. - *Chaenotheca chlorella* is a subcosmopolitan species with a very wide distribution in the northern boreal-temperate zones of the northern hemisphere, occurring in Europe, North America and Central America; for the southern hemisphere it is known from South America, Australia and New Zealand. The Aspromonte Massif is the southernmost locality in Europe. In Calabria the species was usually found on decomposed lignum of deciduous trees (*Fagus sylvatica, Quercus dalechampii*) in shaded and humid situations; it often prefers the lignum found in cavities of the trunks. Occasionally, it was collected also on fissured bark of old conifers (*Abies alba*) and deciduous trees (*Fagus sylvatica*). The distribution map is in Fig. 12.

Associated Caliciales species. - *Chaenotheca chlorella* was collected in very complicated mosaics with other *Caliciales* on an old *Abies alba* tree, with *Cyphelium inquinans*, *Sclerophora peronella*, *Chaenothecopsis debilis*, *Chaenotheca brachypoda*, *Ch. ferruginea*, *Ch. trichialis*, *Calicium adspersum*, *C. salicinum*, and *C. viride*. It was collected also on lignum of *Fagus*, with *Calicium salicinum*.

Chaenotheca chrysocephala (Turner ex Ach.) Th. Fr. in Nova Acta Regial Soc. Sci. Upsal. 3, 250. 1860. ≡ *Calicium chrysocephalum* Turner ex Ach., Meth. Lich. Suppl.: 15. 1803.

Distribution and ecology. - *Chaenotheca chrysocephala* is widely distributed in the northern boreal-temperate zones of the northern hemisphere (Europe, Asia, North and Central America, Africa); in the southern hemisphere it occurs in cool-temperate areas of Australia (Tibell 1987) and New Zealand (Tibell in Galloway 1985). In Calabria *Ch. chrysocephala* is widespread (Fig. 13), being usually found on the bark of conifers: (*Pinus laricio*, *Pinus nigra*, *Abies alba*, *Metasequoia sempervirens*, *Larix decidua* and *Pinus leucodermis*), in young forests, or sometimes even in open situations. From 1150 to 1750 m is the commonest Caliciales species of Calabria, being much rarer at lower elevations. It was collected only once on the bark of an old deciduous tree *Castanea*. New to Calabria.

Associated Caliciales species. - Often associated with *Chaenotheca ferruginea* , *Ch. trichialis*, *Ch. phaeocephala* and *Calicium viride*.

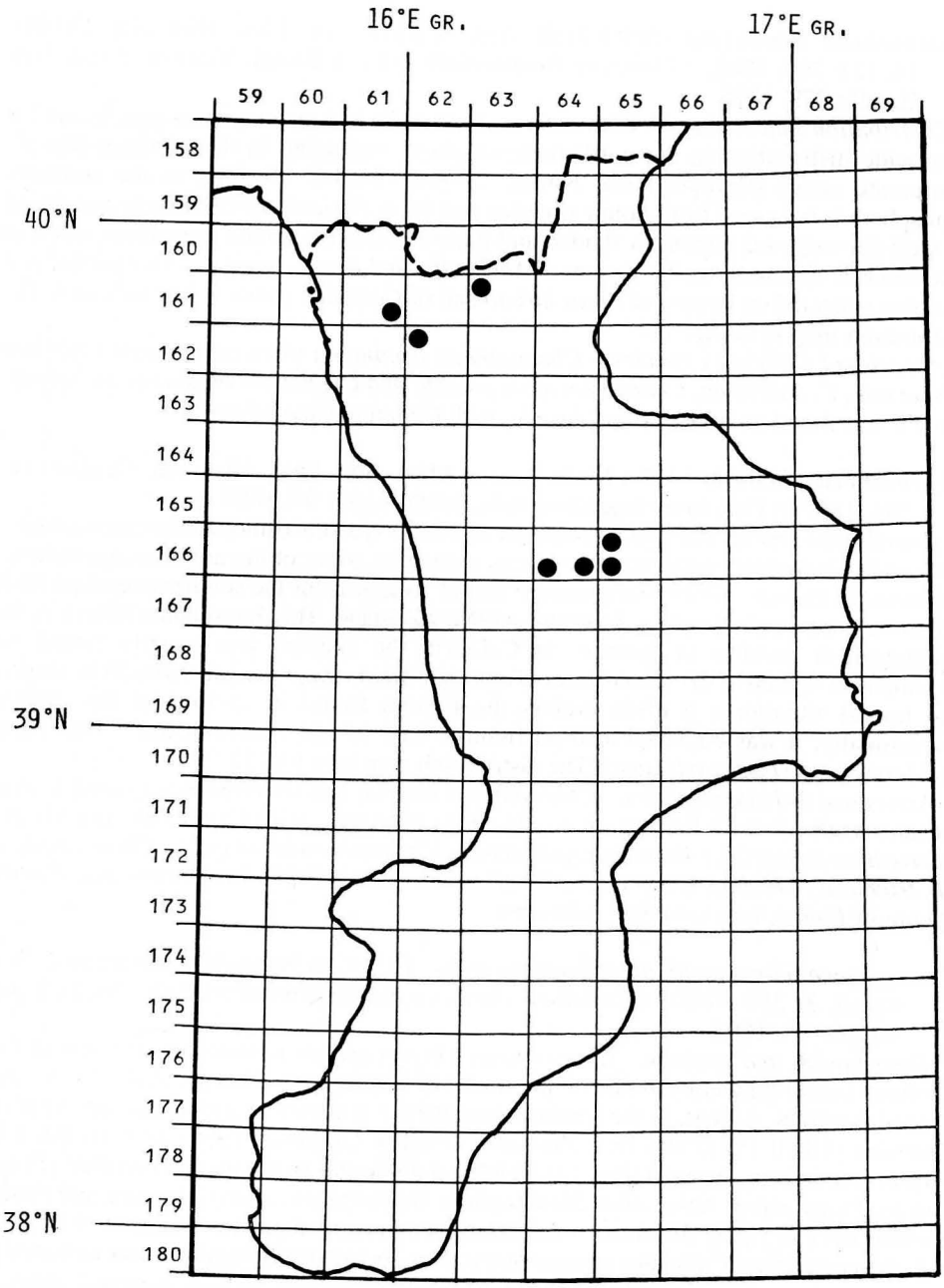

Fig. 10. Distribution of *Chaenotheca brachypoda* in Calabria.

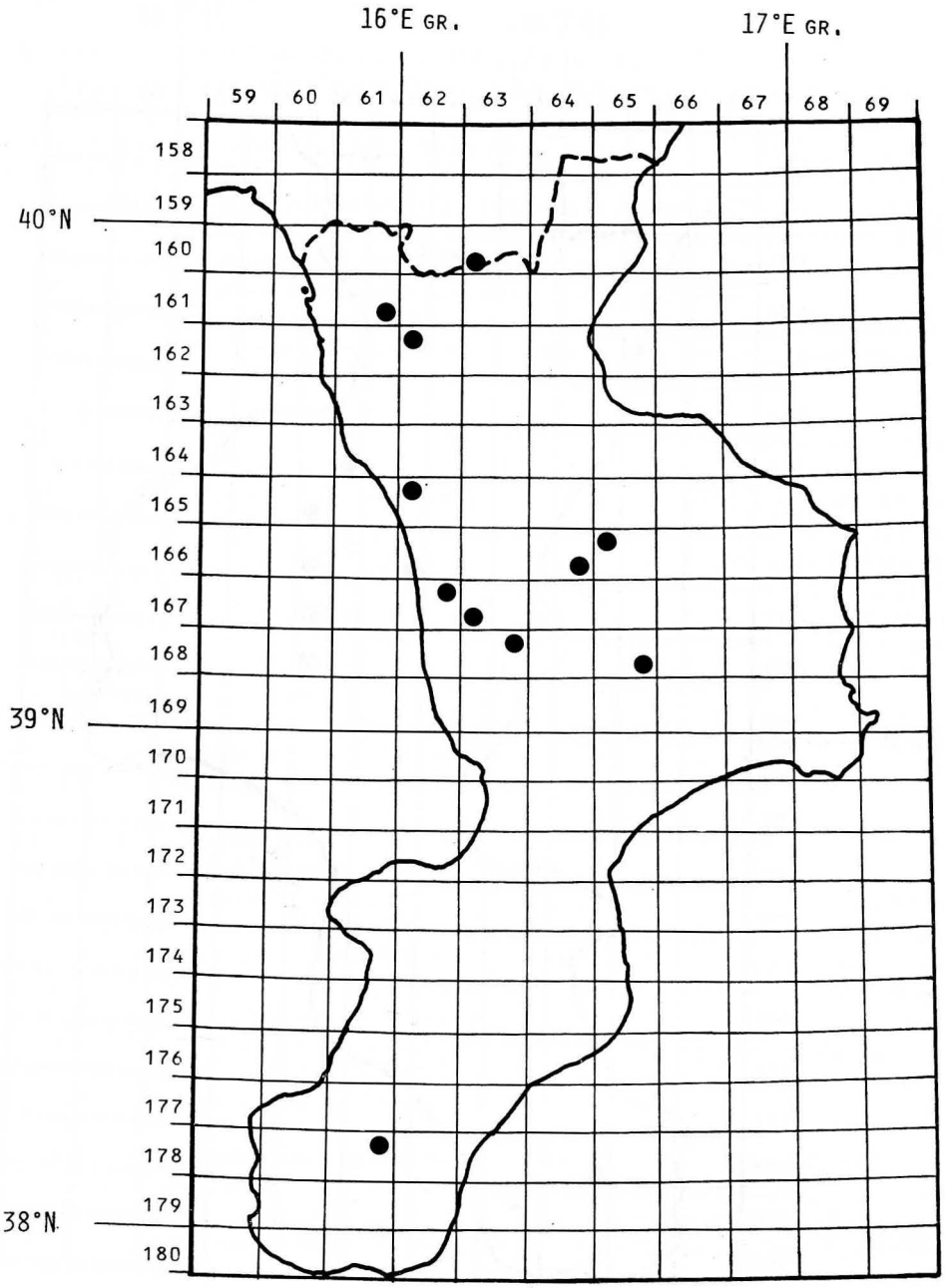

Fig. 11. Distribution of *Chaenotheca brunneola* in Calabria.

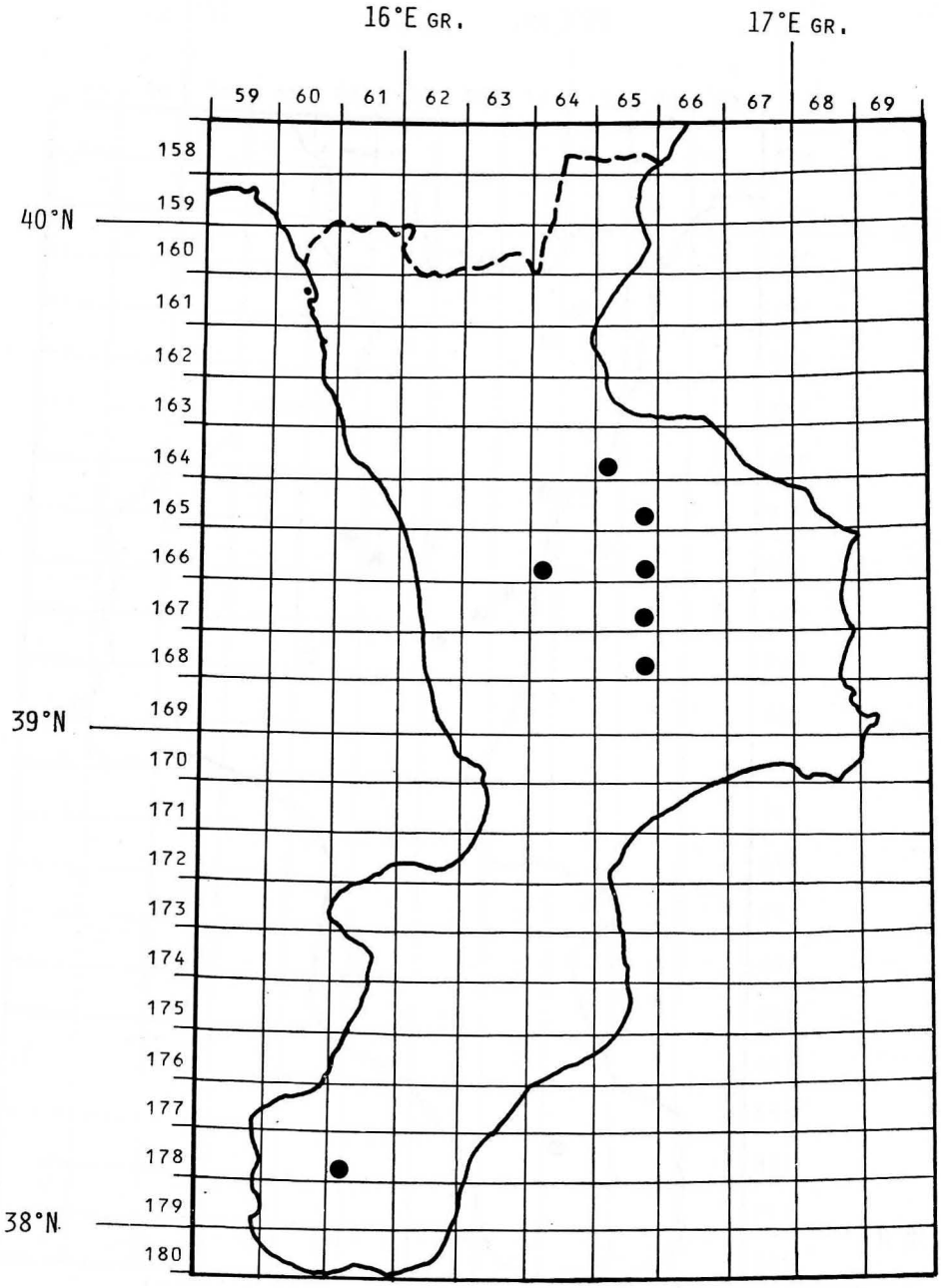

Fig. 12. Distribution of *Chaenotheca chlorella* in Calabria.

Note. - This is a polymorphic species. The thallus is sometimes very tick when growing on bark, thinner when on lignum. The stalk of the apothecia may be more or less slender, and its length is variable.

Chaenotheca ferruginea (Turner ex Sm.) Migula, Krypt.-Fl. Deutsch., 4(2): 479. 1931 ≡ *Calicium ferrugineum* Turner ex Sm. in Smith & Sowerby, Engl. Bot.: 35. 1813.

Distribution and ecology. - *Chaenotheca ferruginea* is a cosmopolitan species. In the northern hemisphere it is widely distributed (Europe, Asia, and North and Central America); in the southern hemisphere it is known from Australia (Tibell 1987) and New Zealand (Tibell in Galloway 1985). In Calabria it occurs at high altitudes, from 1280 to 2200 m, usually on lignum and bark of conifers (*Pinus laricio*, *Pinus leucodermis*), in humid situations. The distribution map is in Fig. 14. New to Calabria.

Associated Caliciales species. - *Chaenotheca ferruginea* was often associated with *Calicium viride* when growing on bark. No associated species were found with specimens on lignum.

Chaenotheca furfuracea (L.) Tibell in Nova Hedwigia, Beih. 79: 664. 1984. ≡ *Lichen furfuraceus* L., Sp. Pl.: 1185. 1753.

Distribution and ecology. - *Chaenotheca furfuracea* is a widespread species, known from Europe, North America, and Argentina (Codogno & al., unpublished data). It is one of the most common *Caliciales* of Calabria (Coastal Range, Serre di Catanzaro, Pollino, Sila and Aspromonte Massives, see Fig. 15). It grows in shaded and humid habitats, on lignum, in bark fissures on trunks of conifers and deciduous trees, mostly near the base or in cavities. It was also collected on roots of fallen conifers and deciduous trees, and on siliceous rocks, often in niches with very low light intensity and constant humidity, protected from rain. More rarely, it was also found on terricolous, epiphytic and epilitic bryophytes, directly on rock or on soil. The elevation ranges between 600 and 1760 m.

Associated Caliciales species. - On bark with *Chaenotheca phaeocephala*, on roots with *Microcalicum arenarium.*

Chaenotheca hispidula (Ach.) Zahlbr. in Cat. Lich. Univ. 1: 567.1922. ≡ *Calicium trachelinum* var. *hispidulum* Ach., Lichenogr. Univ.: 237. 1810.

Distribution and ecology. - *Chaenotheca hispidula* is a cosmopolitan species. In the northern hemisphere it is widely distributed from the northern boreal to the tropical zones (Europe, Asia, North America and Africa); it was reported also from Australia and New Zealand. In Calabria it occurs at low altitudes, from 350 to 850 m (Fig. 17). It is a thermophilous species, which needs a suboceanic to oceanic climate. It usually occurs on lignum of deciduous trees (*Castanea sativa, Quercus pubescens* and *Quercus dalechampii)*, more rarely, it was also collected on the fissured bark of *Abies alba* and *Castanea sativa.*

Associated Caliciales species. - *None found.*

Chaenotheca laevigata Nàdv. in Repert. Spec. Nov. Regni Veg., 36: 307. 1934.

Distribution and ecology. - *Chaenotheca laevigata* is a rarely collected species whose distribution includes Europe, Asia and North America. In Calabria it was found only once, on rough bark at the base of *Abies alba* at 1670 m, in a very humid and shaded situation.

Associated Caliciales species. - *Cyphelium inquinans* and *Cyphelium karelicum.*

Chaenotheca phaeocephala (Turner) Th. Fr. in Nova Acta Regial Soc. Sci. Upsal. 3: 351. 1861. ≡ *Lichen phaeocephalus* Turner, Trans. Linn. Soc. London 8: 260, 1807.

Distribution and ecology. - *Chaenotheca phaeocephala* has a wide distributional range, occurring in Europe, Asia, North America and Nepal. In Calabria it is very common (Fig.

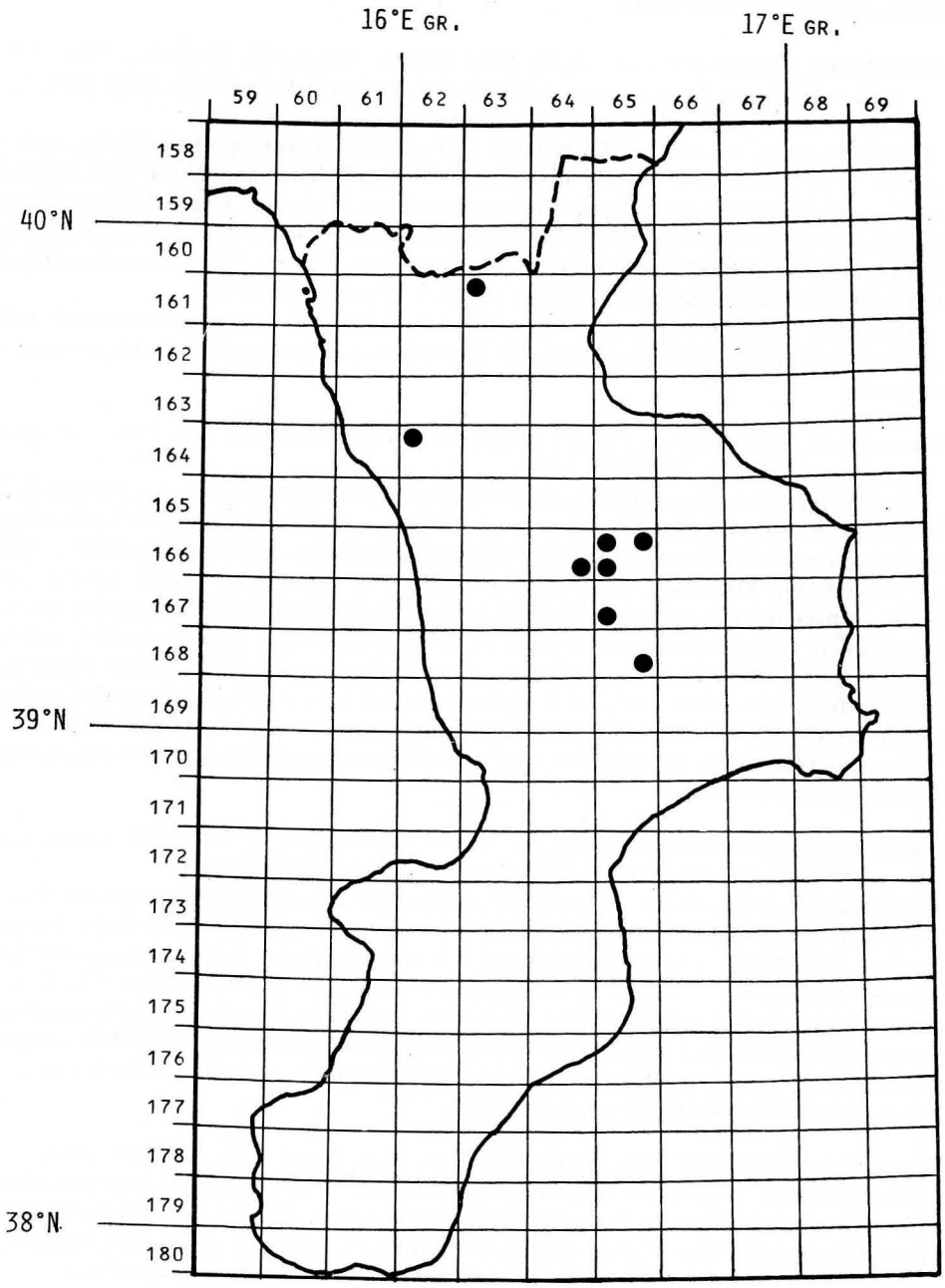

Fig. 13. Distribution of *Chaenotheca crhysocephala* in Calabria.

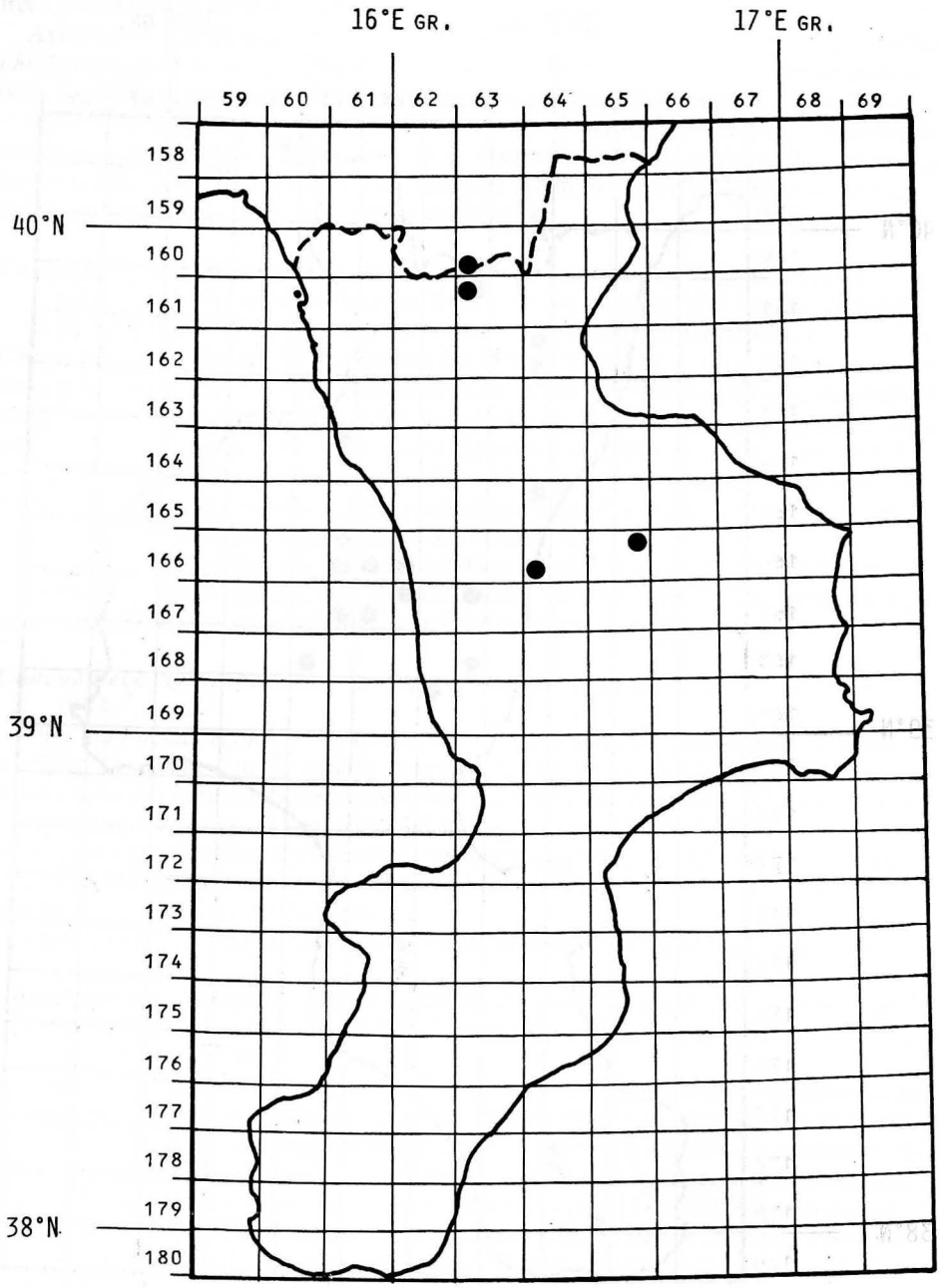

Fig. 14. Distribution of *Chaenotheca ferruginea* in Calabria.

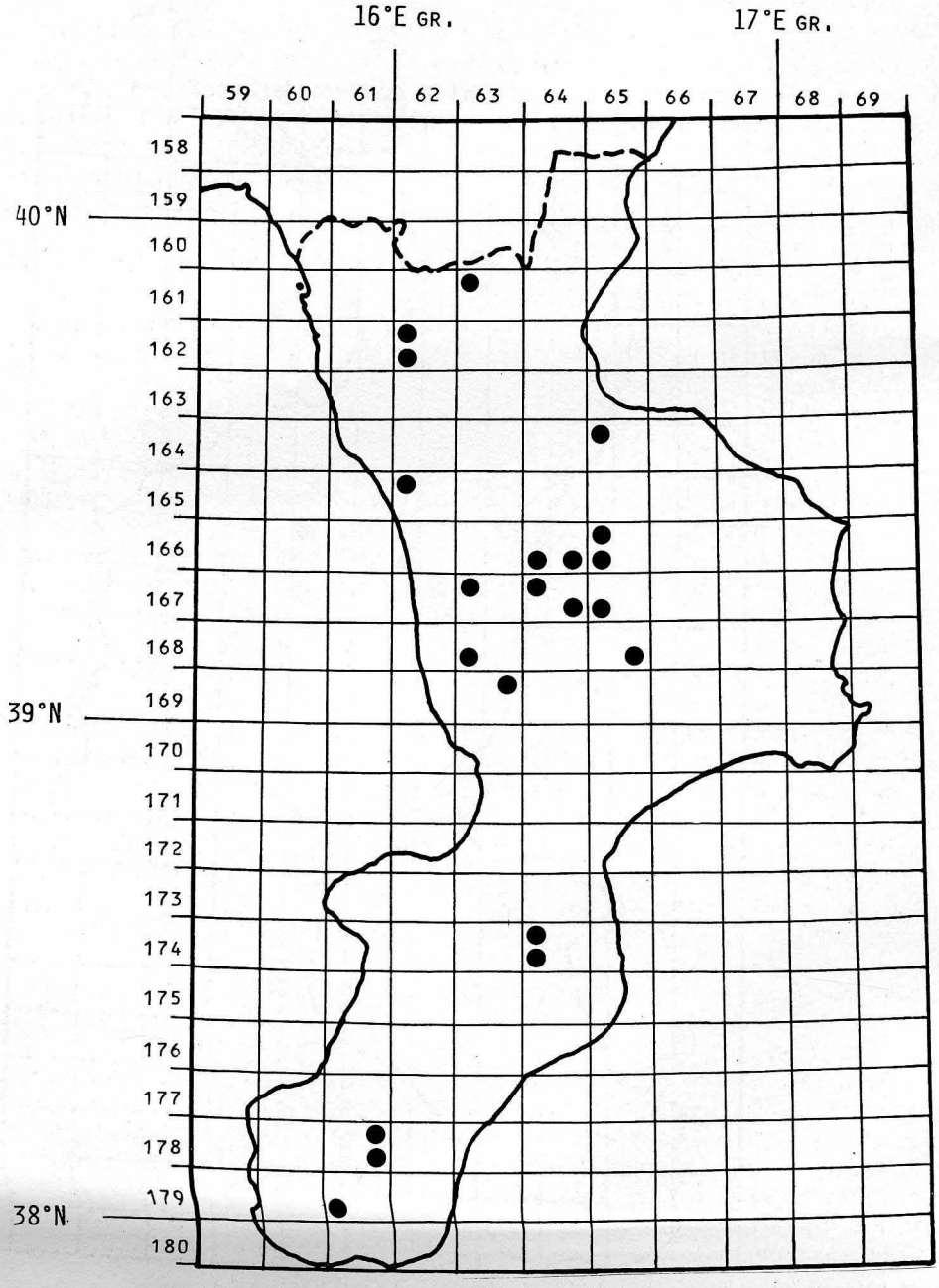

Fig. 15. Distribution of *Chaenotheca furfuracea* in Calabria.

16), and was collected on lignum and bark of deciduous trees (*Castanea sativa*, *Quercus pubescens*)at low elevations. "vicariant phorophytes" at higher elevations are coniferous trees (*Pinus laricio* and *Pinus leucodermis*).

Associated Caliciales species. - Associated with *Calicium viride*, *Chaenotheca chrysocephala*, *Ch. ferruginea*, *Ch. furfuracea*, *Ch. trichialis*, *Cyphelium inquinans* on bark. On lignum of *Pinus laricio* it was collected together with *Cyphelium inquinans*.

Note. - As in other species of *Caliciales*, the colour of the thalli of *Ch.aenotheca phaeocephala* is variable. When growing in open situations the thallus is very thick, has a brown colour, and bears tall and wide capitula; when in shaded habitats it is thinner, of a lighter, green-brown colour, and bears slender stalks.

Chanotheca trichialis (Ach.) Th. Fr. in Nova Acta Regial Soc. Sci. Upsal. 3: 251. 1860 ≡ *Calicium trichiale* Ach. in Kungl. Vetensk.-Akad. Nya Handl.: 283. 1808.

Distribution and ecology. - *Chaenotheca trichialis* is one of the commonest species of *Chaenotheca* in the world. In the northern hemisphere it is very widely distributed throughout the northern boreal and temperate zones; for the southern hemisphere it is known from Argentina, Australia and New Zealand. In Calabria it was found on lignum and bark of deciduous (*Castanea sativa*, *Quercus dalechampii*, *Alnus cordata*, *Fagus sylvatica*) and coniferous trees (*Abies alba* and *Pinus laricio*) usually at the base of very old and rough trunks in moderately shaded and humid situations. It is the commonest species also in Calabria (Fig. 18), from 650 to 2000 m

Associated Caliciales species. - In Calabria usually associated with *Calicium viride*, *Chaenotheca brachypoda*, *Ch. chlorella*, *Ch. chrysocephala*, *Ch. ferruginea*, *Ch. phaeocephala*, *Chaenothecopsis debilis* and *Sclerophora peronella*.

Chaenotheca xyloxena Nàdv. in Repert. Spec. Nov. Regni Veg., 36: 308. 1934.

Distribution and ecology. - *Chaenotheca xyloxena* is a subcosmopolitan species. In the northern hemisphere it is widely distributed, occurring in Europe, Asia and North America; in the southern hemisphere it was reported from Australia and New Zealand. In Calabria it is very rare. It was collected in the Aspromonte, Sila, and Pollino Massives, usually at high elevations, exclusively on lignum in very humid and shaded situations (Fig. 19). Phorophytes are both conifers and deciduous trees (*Fagus sylvatica*, *Abies alba* and *Pinus laricio*). New to Calabria.

Associated Caliciales species. - Sometimes associated with *Calicium salicinum*.

Chaenothecopsis debilis (Turner & Borrer ex Sm.) Tibell in Symb. Bot. Upsal. 21 (2): 45. 1975. ≡ *Calicium debile* Turner & Borrer ex Sm. in Smith & Sowerby, Engl. Bot.: 462. 1813.

Distribution and ecology. - *Chaenothecopsis debilis* is a cosmopolitan species. In the northern hemisphere it occurs in cold temperate to temperate areas of Europe, Asia and North America; it was also reported from Australia and New Zealand. According to Tibell (1987: 122) this species grows on very dry and weathered lignum in open situations, and it is neither accompanied by algae nor by other lichens. In Calabria it is common (Fig. 20), occurring on lignum, often in cavities of old conifers (*Abies alba* and *Pinus laricio*) and deciduous trees (*Castanea sativa*, *Fagus sylvatica* and *Quercus pubescens*). Rarely, it was also collected on bark of *Abies alba* and *Quercus ilex*. New to Calabria.

Associated Caliciales species. - On bark with *Calicium viride*, *Chaenotheca chlorella*, *Ch. trichialis*, *Cyphelium inquinans* and *Sclerophora peronella*. On lignum no associated species were found.

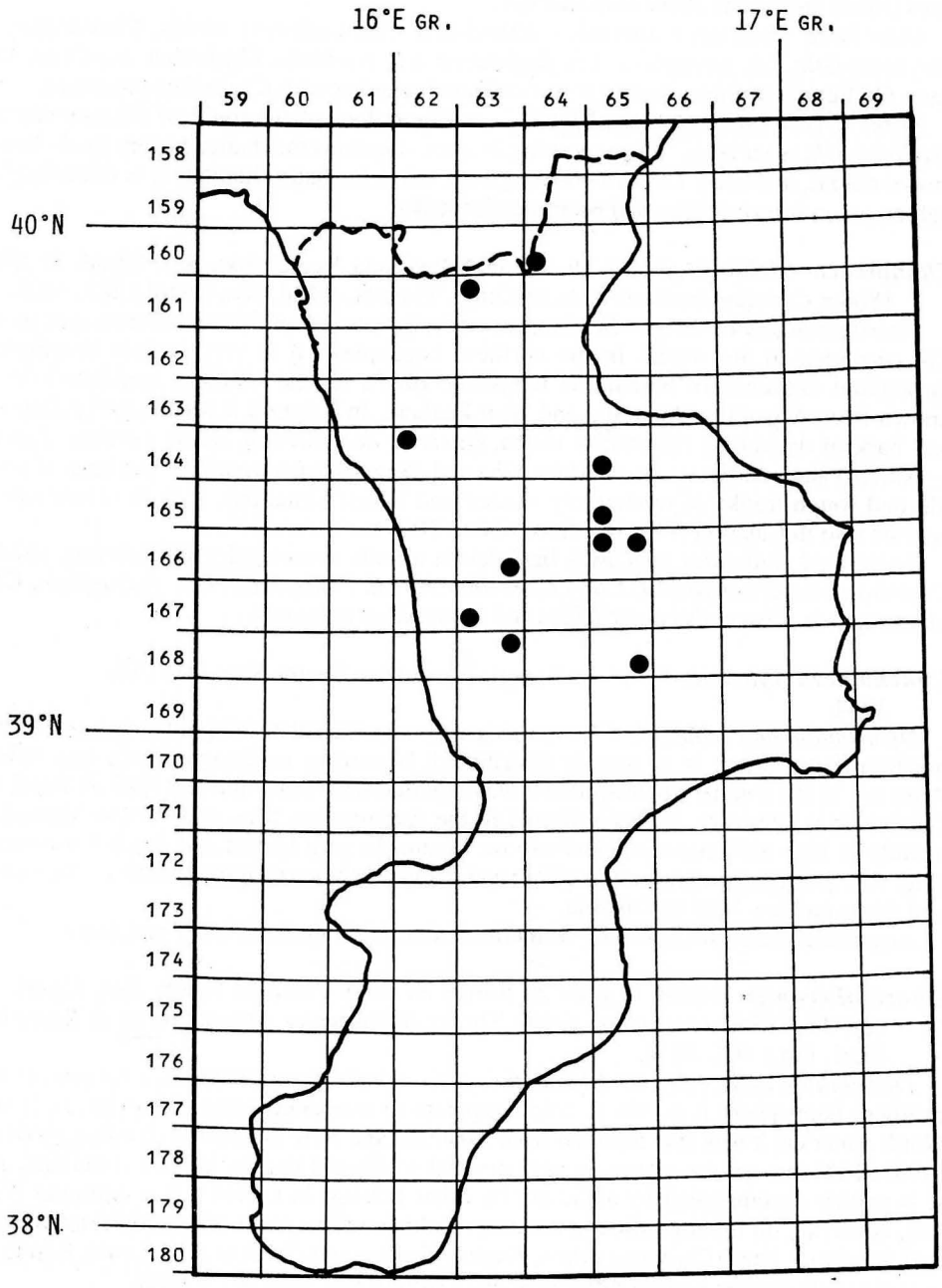

Fig. 16. Distribution of *Chaenotheca phaeocephala* in Calabria.

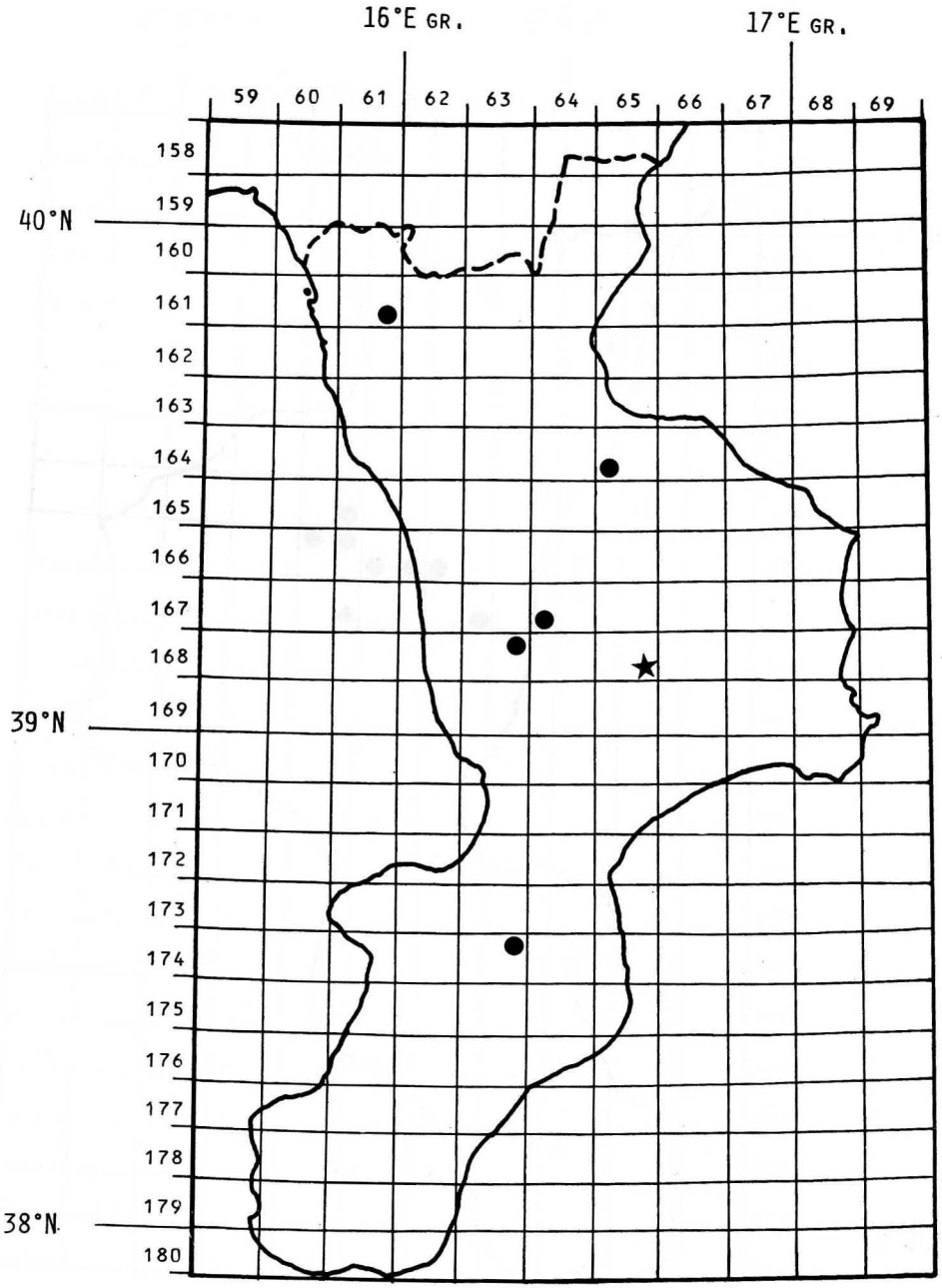

Fig. 17. Distribution of *Chaenotheca laevigata* (stars) and *Chaenotheca hispidula* (circles) in Calabria.

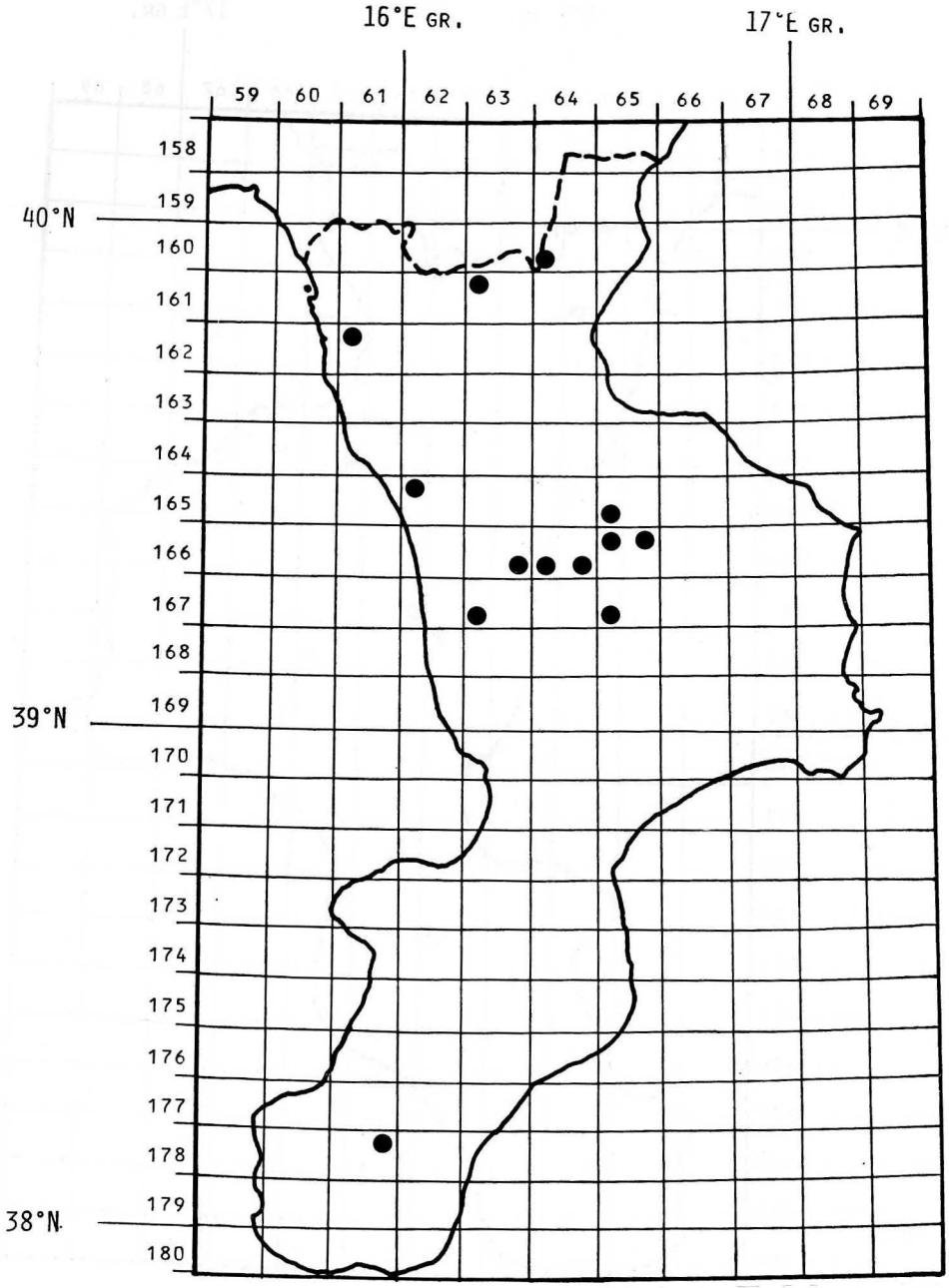

Fig. 18. Distribution of *Chaenotheca trichialis* in Calabria.

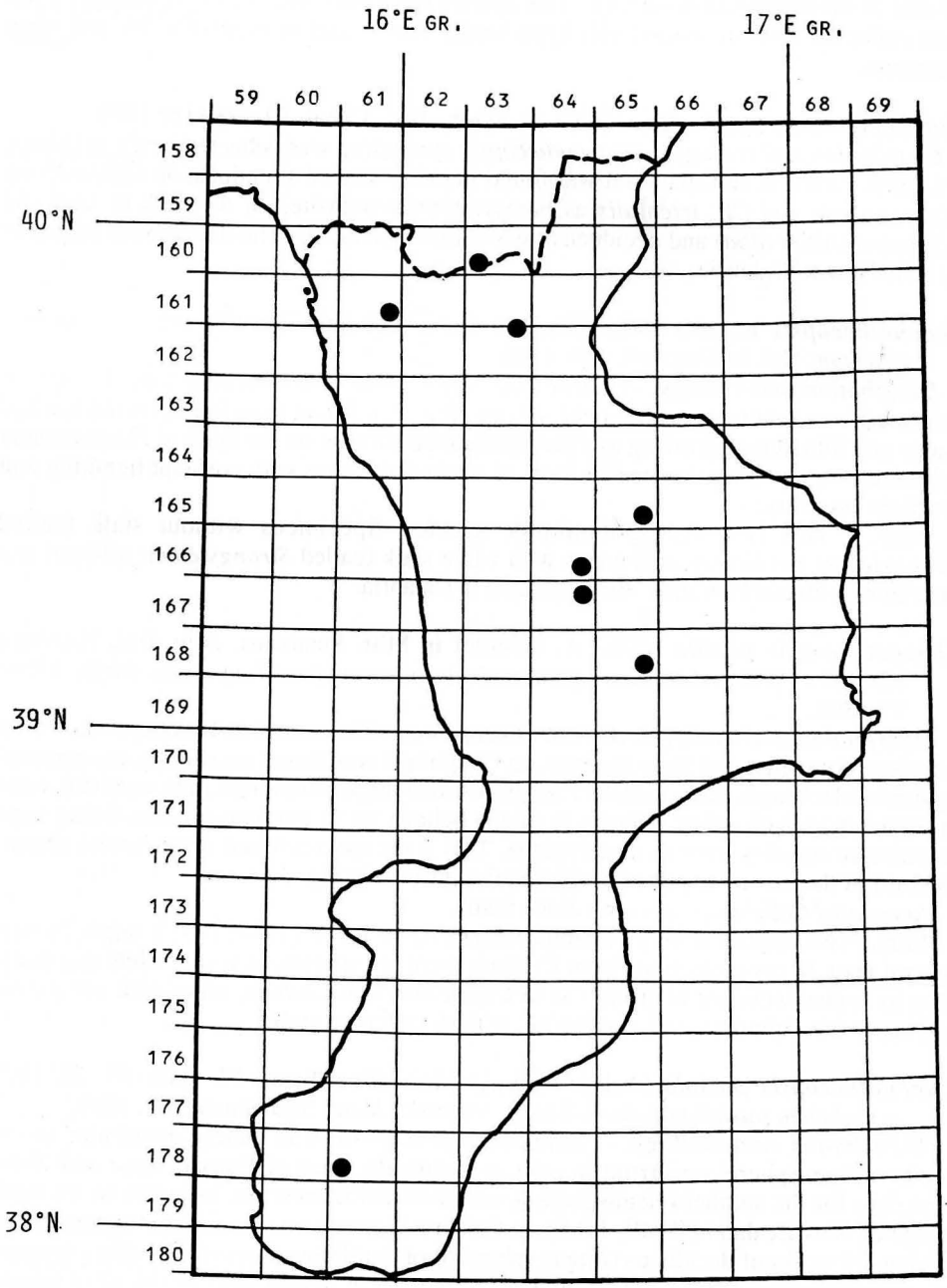

Fig. 19. Distribution of *Chaenotheca xyloxena* in Calabria.

Note. - This is a polymorphic species. Specimens with white capitula (due to an hyphal web, and not to pruina) and specimens with blackish capitula may be found. Also the size of the capitulum is variable. This species has a very wide ecological range; it has been collected both in shaded and hyperhumid stands and in relatively dry and open situations.

Chaenothecopsis epithallina Tibell in Symb. Bot. Upsal. 21 (2):116. 1975.

Distribution and ecology. - *Chaenothecopsis epithallina* was collected rarely in Europe and North America. In Calabria it was found in rather shaded situations, on *Chaenotheca phaeocephala* and *Ch. trichialis* as parasymbiontic/parasite, on the bark of very old coniferous (*Abies alba*) and deciduous trees (*Fagus sylvatica*). The distribution map is in Fig. 21. New to Calabria.

Chaenothecopsis exserta (Nyl.) Tibell in Nova Hedwigia 79: 666. 1984 ≡ *Calicium exsertum* Nyl. in Flora 69: 466. 1886.

Distribution and ecology. - *Chaenothecopsis exserta* is known only from Europe. In Calabria it is a relatively widespread species (Fig. 21). It has been found on the Coastal Range and Sila Massif growing as a parasymbiontic/parasite on the thalli of *Haematomma ochroleucum*, normally on vertical faces or in shaded niches with constant humidity and low light intensity.

Note. - This is a very polimorphic species. Specimens without stalk (called *Strongyleuma paroicum*), specimens with white stalk (called *Strongyleuma albipes*) and specimens with blackish stalk were collected in Calabria.

Chaenothecopsis pusilla (Ach.) A. Schmidt in Mitt. Staatsinst. Allg. Bot. Hamburg 13: 151. 1970 ≡ *Calicium sphaerocephalum* var. *pusillum* Ach., Meth. Lich.: 92.1803.

Distribution and ecology. - *Chaenothecopsis pusilla* occurs in Europe, Asia, North America, Australia, and New Zealand. In Calabria it was found on slightly decomposed lignum of deciduous trees, such as *Castanea sativa*, exposed to high light intensity, often in association with other lichens; it might behave as as parasite on free-living algal colonies, or possibly even as a saprophyte. This is the species found at the lowest altitude (300 m) in the survey region. The distribution map is in Fig. 22.

Associated Calicialaes species. - None found.

Note. -This species is very variable. According to Tibell (1987: 145) it might include several taxa. In my collections from Calabria there are specimens with a white capitulum (due to hyphal web, not to pruina) as in *Chaenothecopsis debilis*, other with aeruginose and brownish capitulum, and aeruginose, withish or brown stalk.

Chaenothecopsis pusiola (Ach.) Vainio in Medd. Soc. Fauna Fl. Fenn. 57: 70. 1927 ≡ *Calicium pusiolum* Ach. in Kungl. Vetensk.-Akad. Nya Handl.:231. 1817.

Distribution and ecology. - *Chaenothecopsis pusiola* is widely distributed in the northern hemisphere, occurring in cold to temperate areas of Europe, Asia and North America; for the southern hemisphere it was recorded from a few localities in the north island of New Zealand (Tibell, 1985). In Calabria it grows on decomposed lignum in the cavities of trunks of deciduous (*Fagus sylvatica*) or coniferous trees (*Abies alba*), growing as parasymbiontic/parasite on *Chaenotheca brunneola* in shaded and very moist situations. Distribution map: Fig. 23.

Associated Caliciales species. - When on lignum it was not associated with other *Caliciales*. On the bark of conifers it was collected with *Cyphelium inquinans*, *Chaenotheca chlorella*, *Ch. trichialis*.

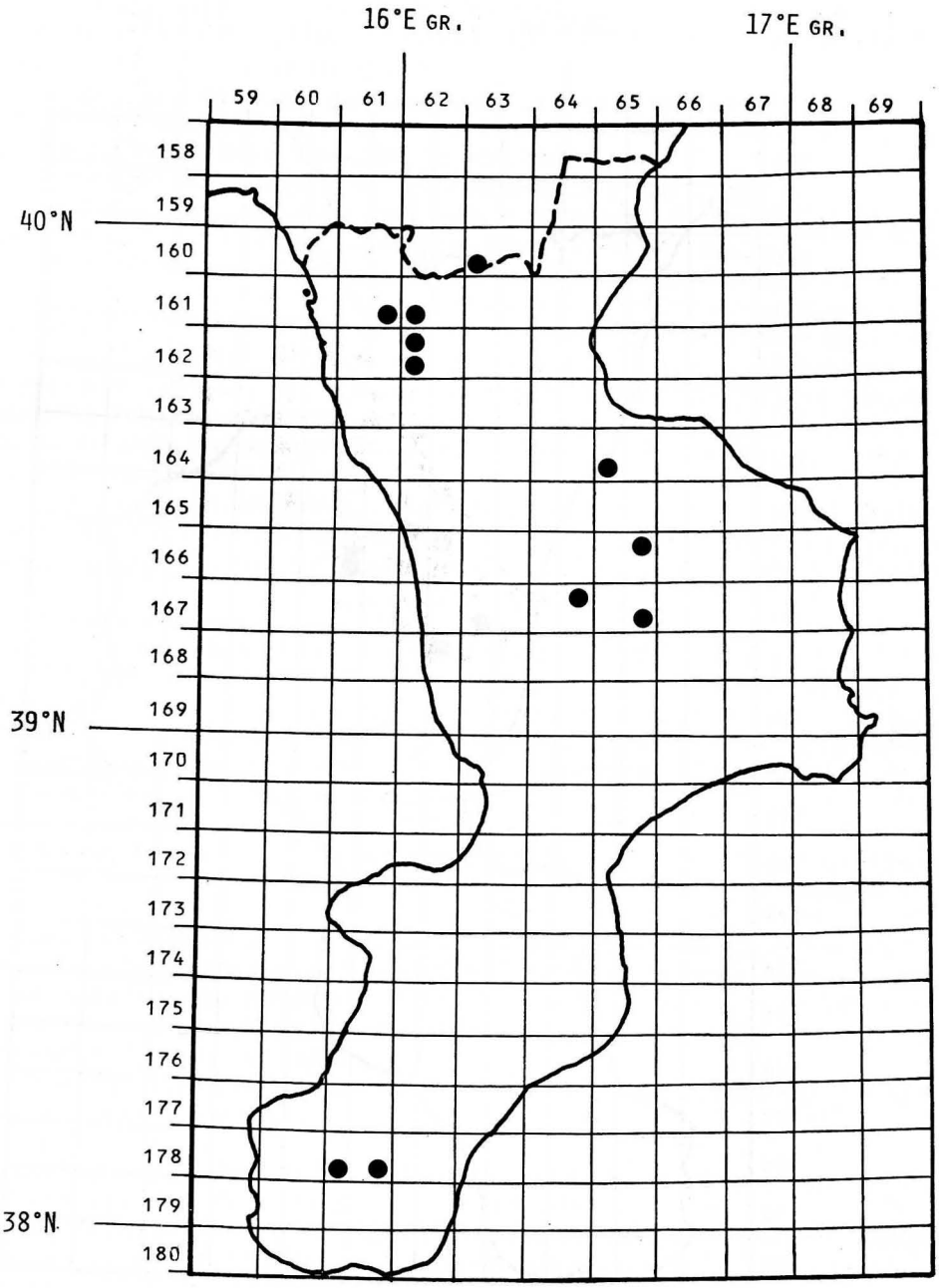

Fig. 20. Distribution of *Chaenothecopsis debilis* in Calabria.

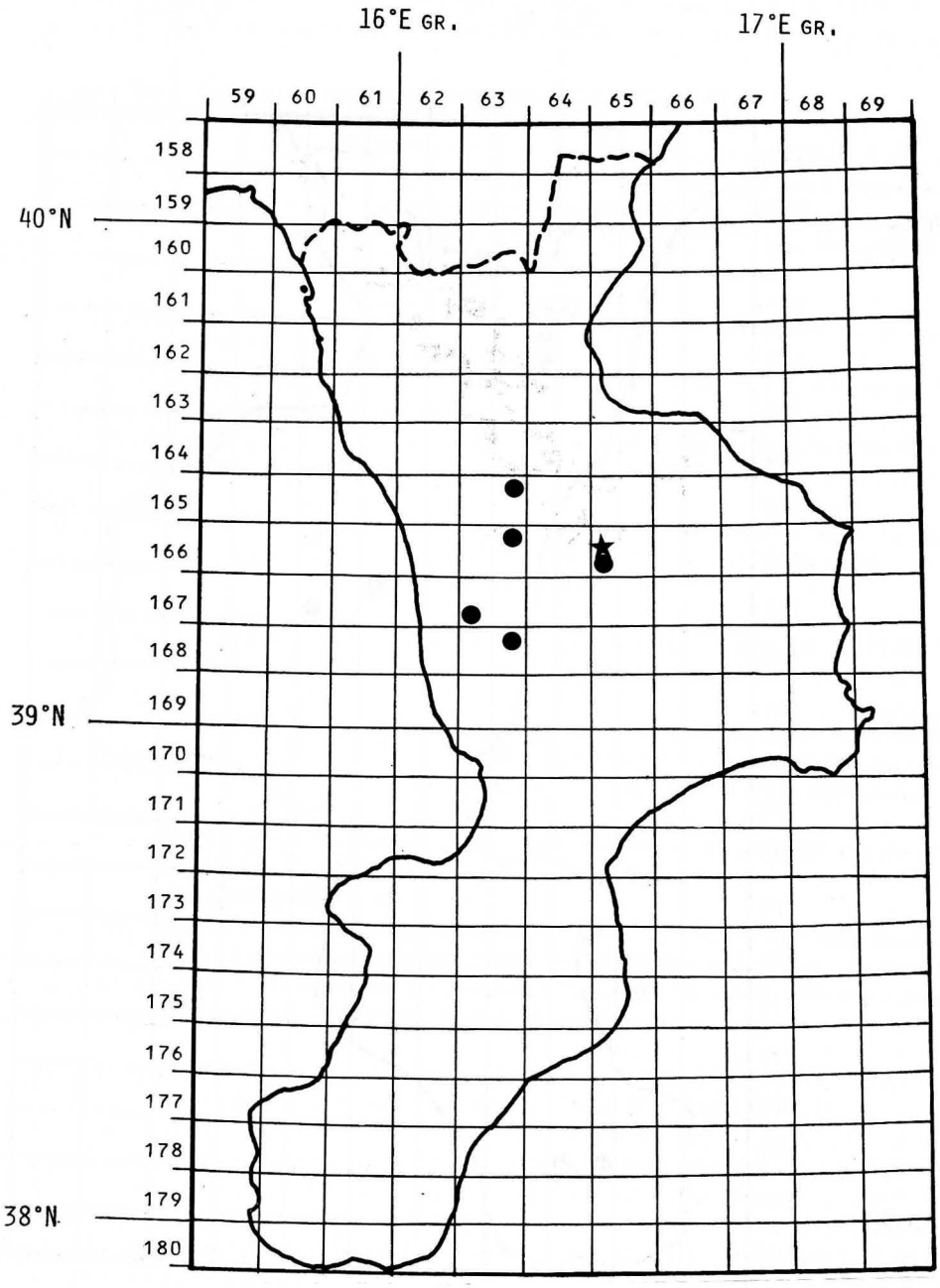

Fig. 21. Distribution of *Chaenothecopsis exerta* (circles) and *Chaenothecopsis epithallina* (stars) in Calabria.

Chaenothecopsis treicheliana (Stein) Kalb in Herzogia 6: 71-83. 1982 ≡ *Calicium treichelianum* Stein in Schrift. Naturforsch. Ges. Danzig, ser. 2, 6: 89. 1885.

Distribution and ecology. - In Calabria *Chaenothecopsis treicheliana* was collected only once on the thallus and apothecia of *Lecanora* sp. at a relatively high altitude (1380 m) in an open situation (Fig. 22). The species is new to Italy.

Cyphelium inquinans (Sm.) Trevisan in Flora 45: 4. 1862 ≡ *Lichen inquinans* Sm. in Smith & Sowerby, Engl. Bot. 12: 810. 1801.

Distribution and ecology. - *Cyphelium inquinans* is widely distributed in Europe and North America; for the southern hemisphere it was reported by Tibell (1987: 168) from Australia and New Zealand. According to Tibell (1971: 147) this species is the most common of *Caliciales* on lignum and dry and decorticated twigs of living *Larix*, *Picea* and *Pinus*. In Calabria it is very localized and rare, occurring normally on high mountains (Pollino, Sila and Aspromonte), on the basal parts of rough-barked, old trunks of *Abies alba* and *Pinus laricio*. It was also collected on stumps in shaded and moist positions, always north-exposed, and at relatively low altitudes. Once it was also found directly on acid rock. It was never found on dry decorticated twigs of living trees, as in Central and northern Europe. Aspromonte its southernmost locality in Europe. The distribution map is in Fig. 24.

Associated Caliciales species. - Mainly found, on lignum, with *Calicium salicinum*, *Chaenotheca phaeocephala* , and once with *Cyphelium karelicum*. On bark it was collected with *Calicium adspersum*, *C. salicinum*, *C. viride*, *Chaenotheca laevigata* and *Ch. phaeocephala*.

Cyphelium pinicola Tibell in Svensk Bot. Tidskr. 63: 465. 1969.

Distribution and ecology. - *Cyphelium pinicola* is widely distributed in Europe and North America. It is rare in Calabria, in open stands at the base of old trees, on the bark of *Pinus laricio* at high altitudes in the Sila Massif. It was never found on dry twigs as reported by Tibell (1971: 156) for central Europe. The distribution map is in Fig. 25.

Associated Caliciales species. - None found.

Cyphelium karelicum (Vainio) Räsänen in Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo 12: 188. 1939 ≡ *Cyphelium lucidum* var. *karelicum* Vainio in Acta Soc. Fauna Fl. Fenn. 57: 21. 1927.

Distribution and ecology. - *Cyphelium karelicum* is a rather rare species, common only in Finland and in some parts of Sweden (Tibell, 1971). In Calabria it was collected only twice in the Sila Massif (Monte Gariglione), on the basal parts of trunks of very old *Abies alba*, in shaded and moist valleys. The localities in Calabria (Fig. 25) are probably the southernmost ones in Europe.

Associated Caliciales species. - Found with *Cyphelium inquinans*, *Chaenotheca laevigata* and *Calicium viride*.

Cyphelium sessile (Pers. ex Mérat) Trevisan in Flora 45: 4. 1862 ≡ *Calicium sessile* Pers. ex Mérat, Nouv. Fl. Env. Paris 2: 169.1821.

Distribution and ecology. - *Cyphelium sessile* is a rarely collected species in Europe. In Calabria it was found only twice, as a parasymbiontic-parasite on *Pertusaria*, on the bark of very old trees (*Castanea sativa*), in the Sila Massif (Savuto Valley) at 1000 m, in humid and shaded situations. It was collected also in the Serre, on lignum of *Olea europaea* at low altitude, in a relatively open situation. The distribution map is in Fig. 25.

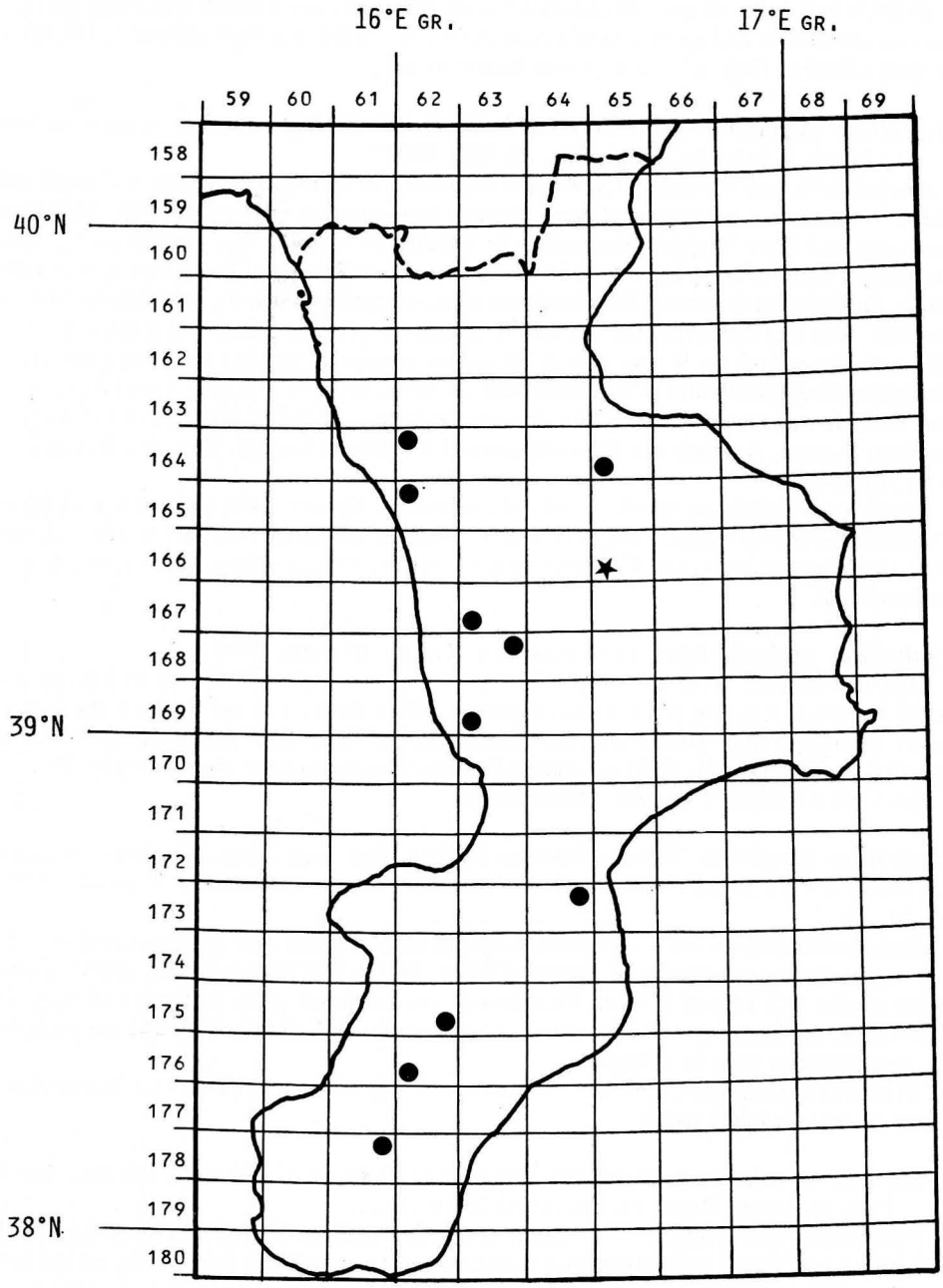

Fig. 22. Distribution of *Chaenothecopsis pusilla* (circles) and *Chaenothecopsis treicheliana* (stars) in Calabria.

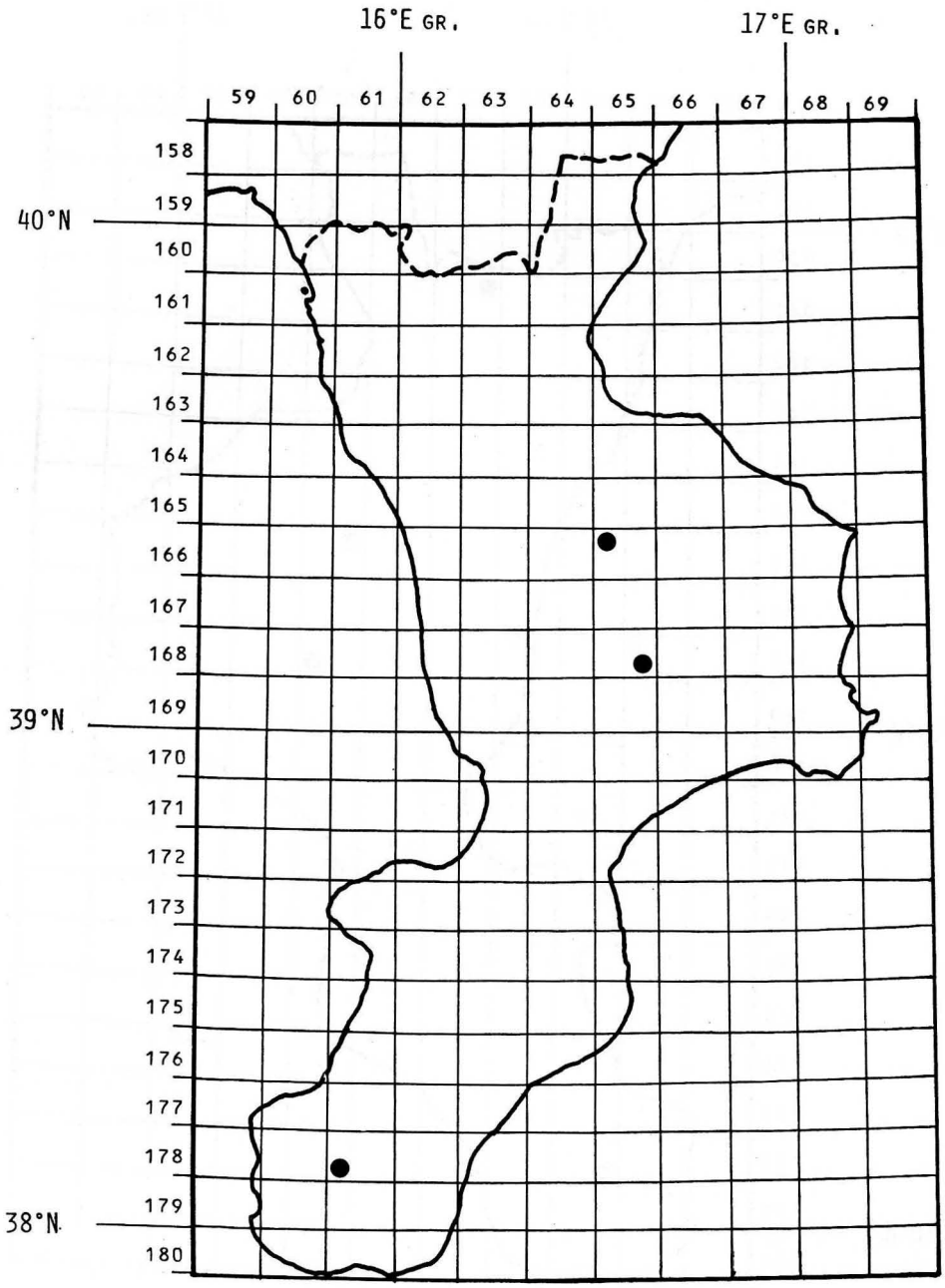

Fig. 23. Distribution of *Chaenothecopsis pusiola* in Calabria.

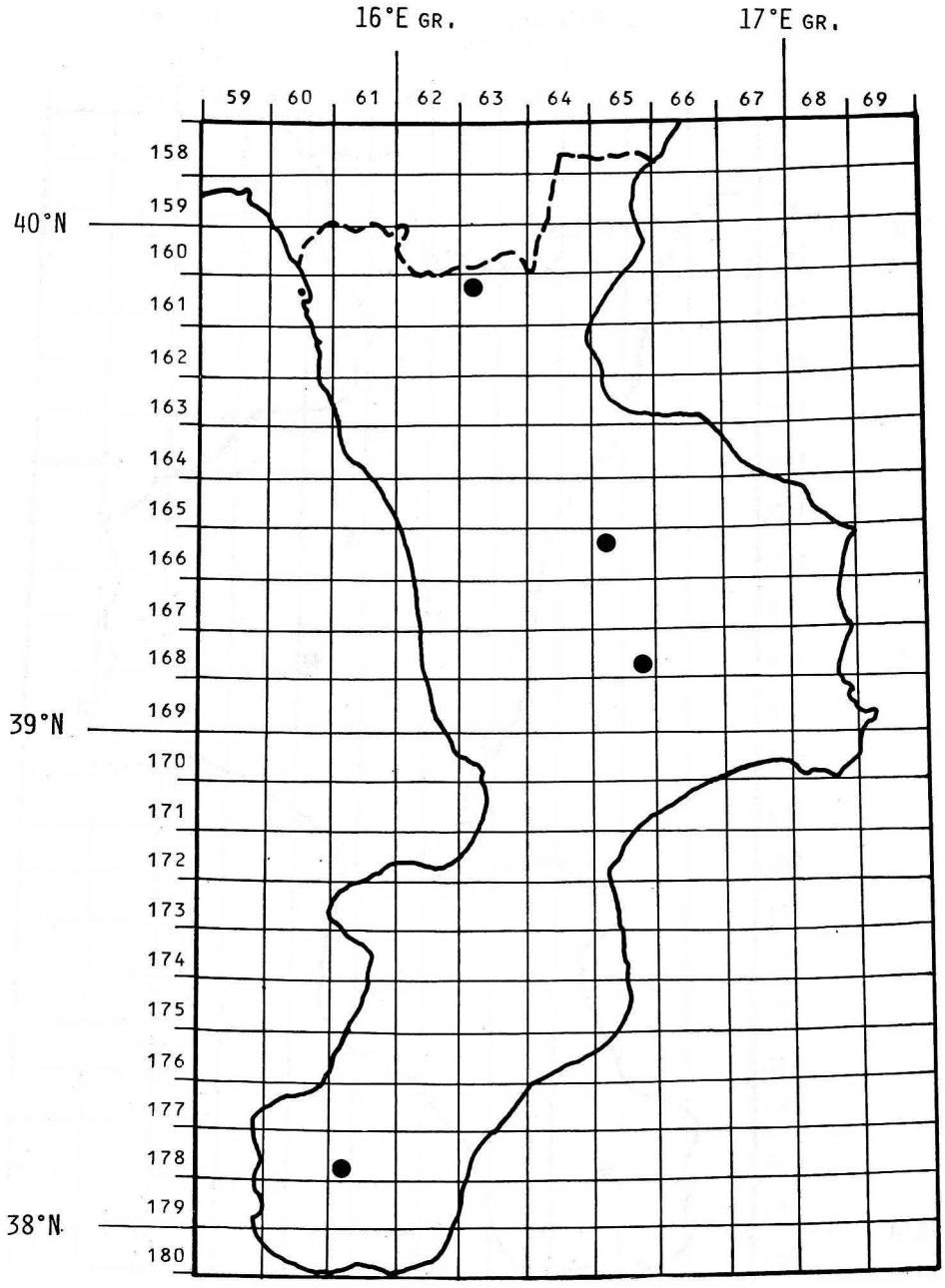

Fig. 24. Distribution of *Cyphelium inquinans* in Calabria.

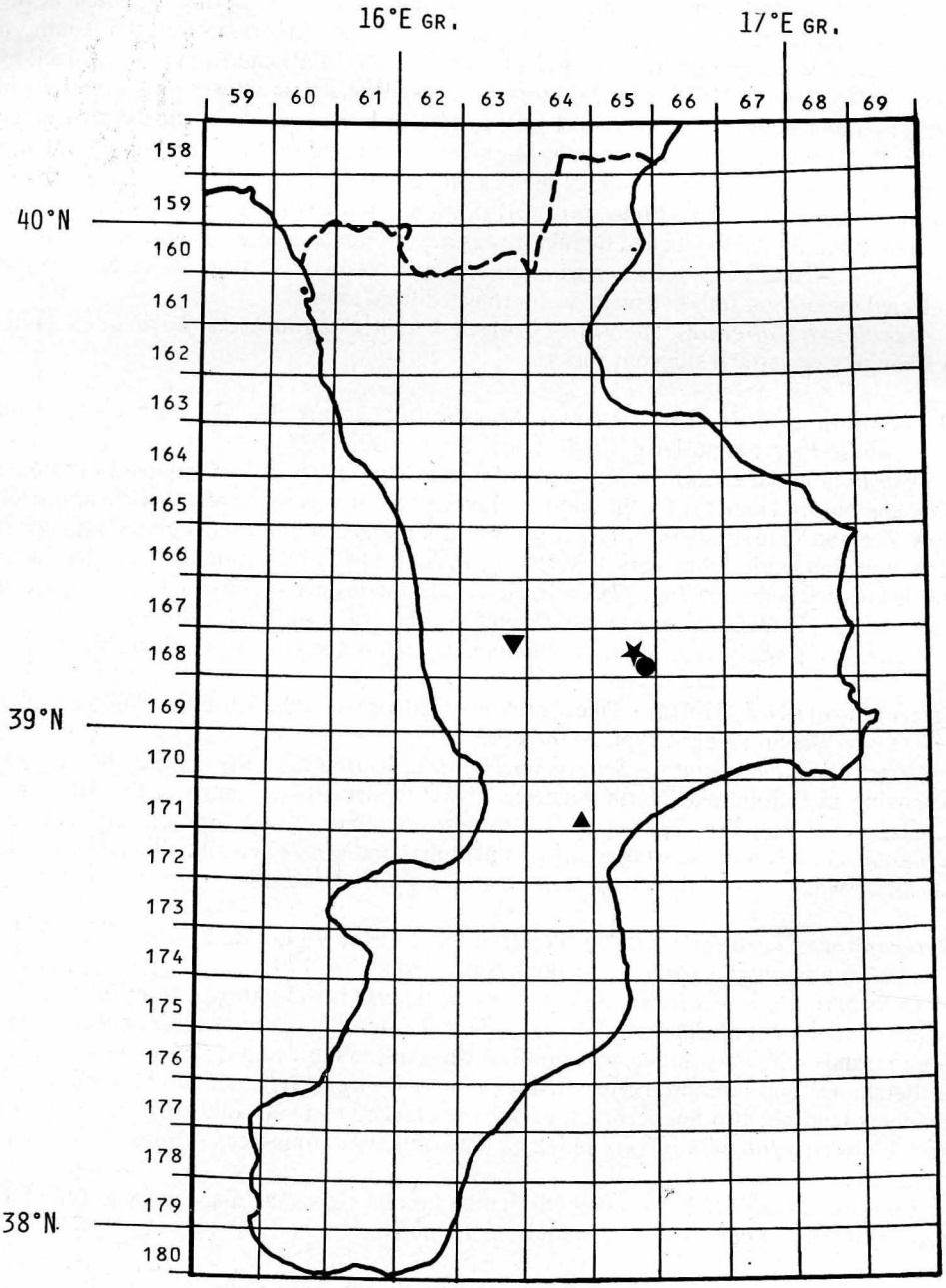

Fig. 25. Distribution of *Cyphelium pinicola* (circles), *Cyphelium karelicum* (stars) and *Cyphelium sessile* (triangles) in Calabria.

Microcalicium arenarium (Hampe ex Massal.) Tibell in Bot. Not. 131: 237. 1978 ≡ *Cyphelium arenarium* Hampe ex Massal., Misc. Lichenol. 1: 20. 1856.

Distribution and ecology. - *Microcalicium arenarium* is widely distributed in the northern hemisphere, occurring in Europe and North America. For the southern hemisphere it was reported from Australia by Tibell (1987: 173) and from New Zealand by Tibell (1985: 293). Tibell (1978: 237) reports this species as growing on exposed roots of conifers along road-cuts or in gravel pits. In Calabria the species is widely distributed (Coastal Range, Sila and Aspromonte Massives), from 920 to 1380 m (Fig. 26). It was found on the roots of deciduous trees such as *Fagus sylvatica* and *Castanea sativa*, and of conifers (*Abies alba* and *Pinus laricio*), in niches with very low light intensity and constant humidity, never wetted by rain. It was never seen on lignum as reported by Tibell (1987: 173). Usually it is found under overhanging or vertical siliceous rocks. Once it was collected directly on soil, in a niche well-protected from rain.

Associated Caliciales species. - Collected with *Chaenotheca furfuracea* under overhanging or vertical siliceous rocks.

Mycocalium subtile (Pers.) Szat. in Magyar Bot. Lapok 24: 47. 1926 ≡ *Calicium subtile* Pers., Tent. Disp. Meth. Fung. Suppl.: 60. 1797.

Distribution and ecology. - *Mycocalicium subtile* is very widely distributed in Europe, Asia and North America; for the southern hemisphere it was reported from Australia and New Zealand (Tibell, 1987: 192). It grows on slightly decomposed lignum exposed to high light intensity, from very low (50 m) to high (1450 m) altitudes. In Calabria the species is very common (Fig. 27), on lignum of deciduous trees (*Castanea sativa*, *Quercus dalechampii* and *Olea europaea*) and of conifers (*Abies alba* and *Pinus laricio*).

Associated Caliciales species. - *Cyphelium inquinans* and *Calicium salicinum.*

Sclerophora nivea (Hoffm.) Tibell in Nova Hedwigia, Beih. 79: 679. 1984 ≡ *Trichia nivea* Hoffm., Veg. Crypt. 2: 14. 1700.

Distribution and ecology. - *Sclerophora nivea* is distributed in the northern hemisphere, occurring in Europe and North America. It was collected only once in the Sila Greca (Cozzo del Pesco, Fig. 28) where it was very abundant on the bark of very old trees (*Quercus dalechampii*, *Castanea sativa*) in humid and semi-open situations. In the same locality it was growing also on the bark of a very old *Hedera helix.*

Sclerophora peronella (Ach.) Tibell in Nova Hedwigia, Beih. 79: 679. 1984 ≡ *Lichen peronellus* Ach., Lichenogr. Suec. Prodr.: 84. 1792.

Distribution and ecology. - *Sclerophora peronella* is only known from Europe. It is relatively common in Calabria (Fig. 28), where it is found in pure or mixed beech and fir-beech stands with very abundant rainfall. It was collected on slightly decomposed lignum of deciduous and coniferous trees (*Abies alba* and *Fagus sylvatica*)in very humid and shaded situations. It often occurs in cavities of cracked and very old trees. It is more rare on the oligotrophic bark of very old deciduous and coniferous trees (*Fagus sylvatica* and *Abies alba*).

Associated Caliciales species. - On lignum no other associated species was found. On bark with *Chaenotheca brachypoda* and *Ch. trichialis.*

Sphaerophorus globosus (Hudson) Vainio in Result Voy. Belgica, Bot.: 35. 1903 ≡ *Lichen globosus* Huds., Fl. Angl.: 460. 1762.

Distribution and ecology. - *Sphaerophorus globosus* is a temperate to subartic-circumboreal species, rather widely distributed in the northern hemisphere (Europe and North America). In Calabria it is relatively widespread (Pollino, Sila and Aspromonte

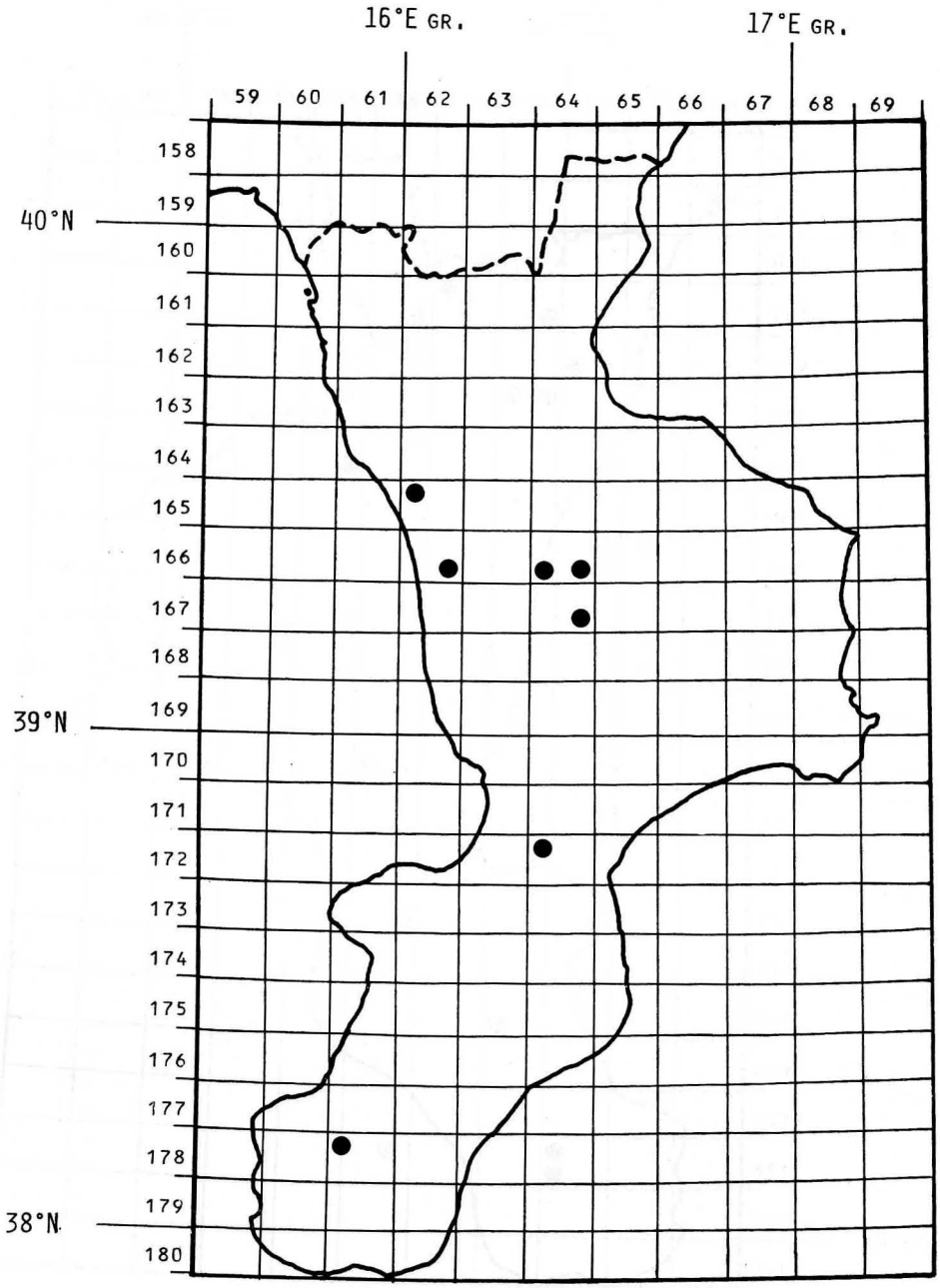

Fig. 26. Distribution of *Microcalicium arenarium* in Calabria.

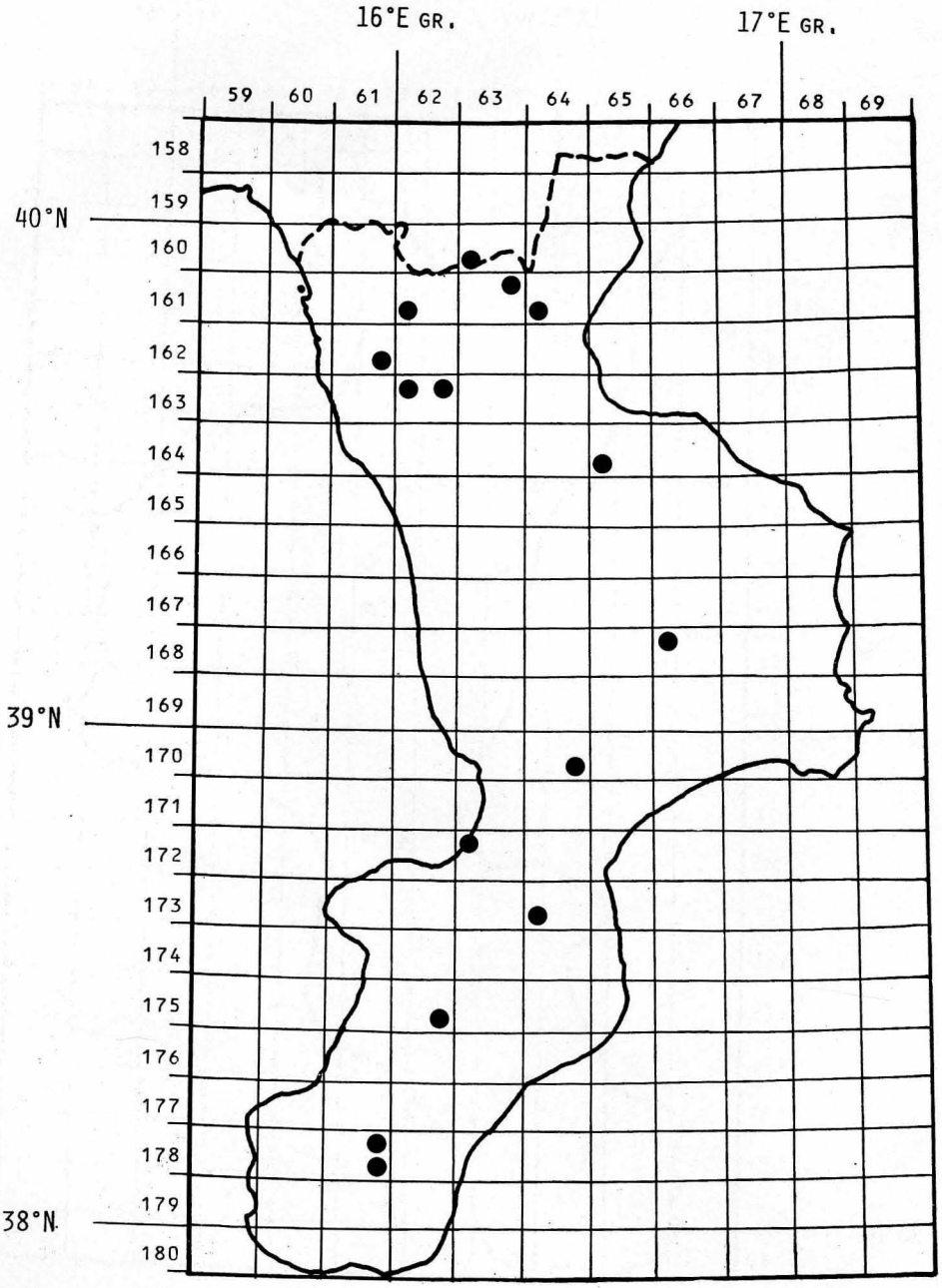

Fig. 27. Distribution of *Mycocalicium subtile* in Calabria.

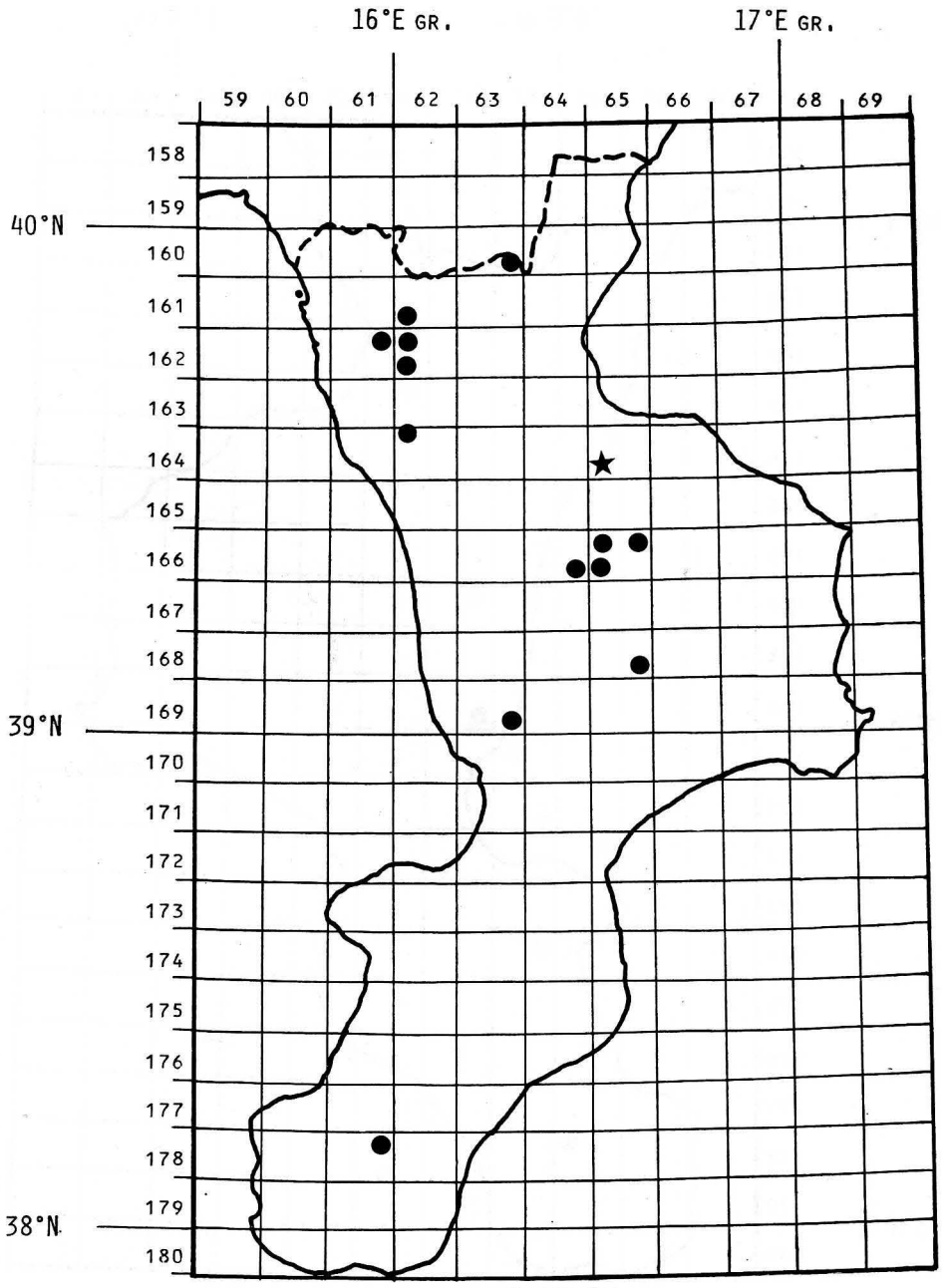

Fig. 28. Distribution of *Sclerophora nivea* (stars) and *Sclerophora peronella* (circles) in Calabria.

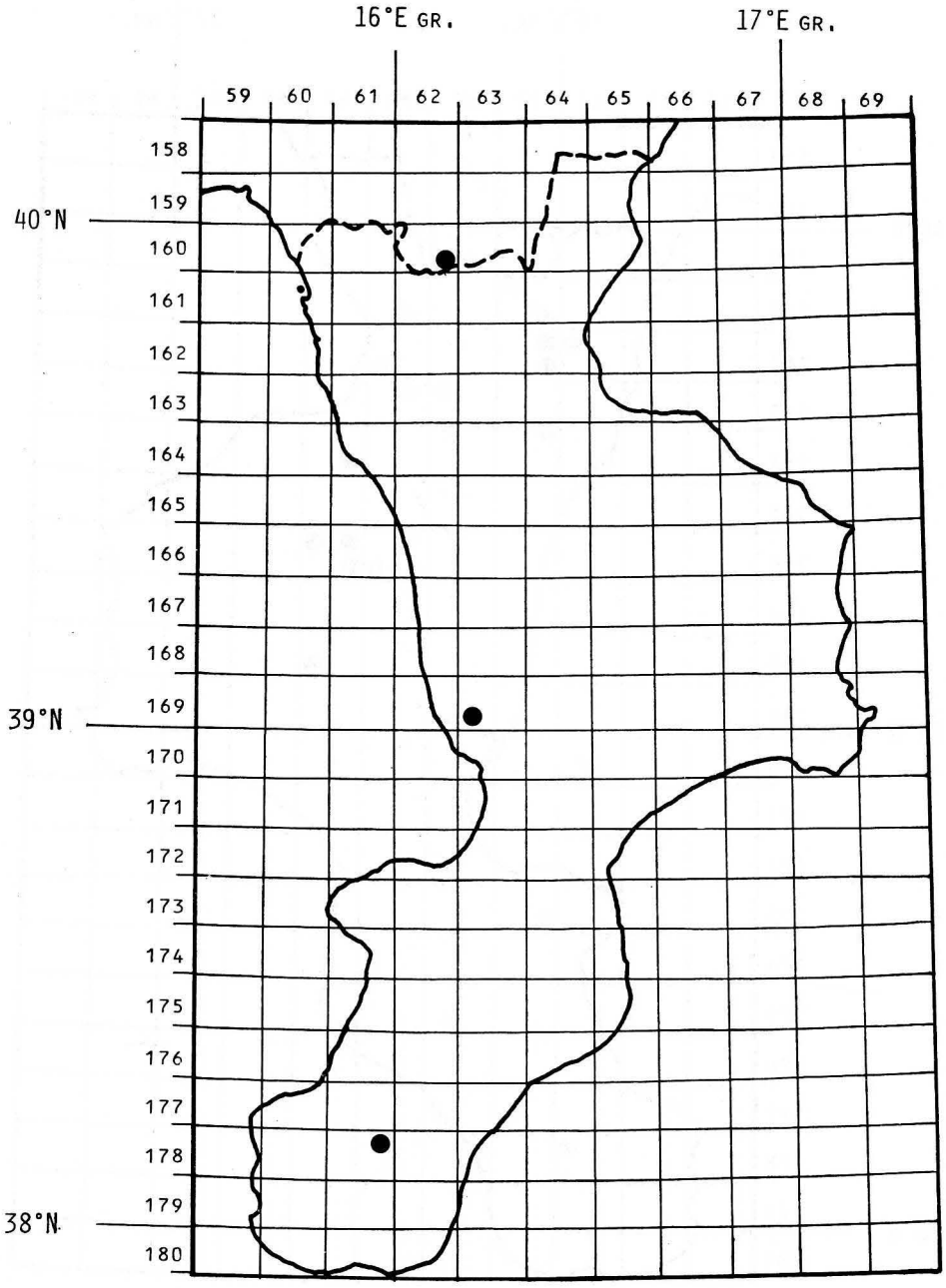

Fig. 29. Distribution of *Sphaerophorus globosus* in Calabria.

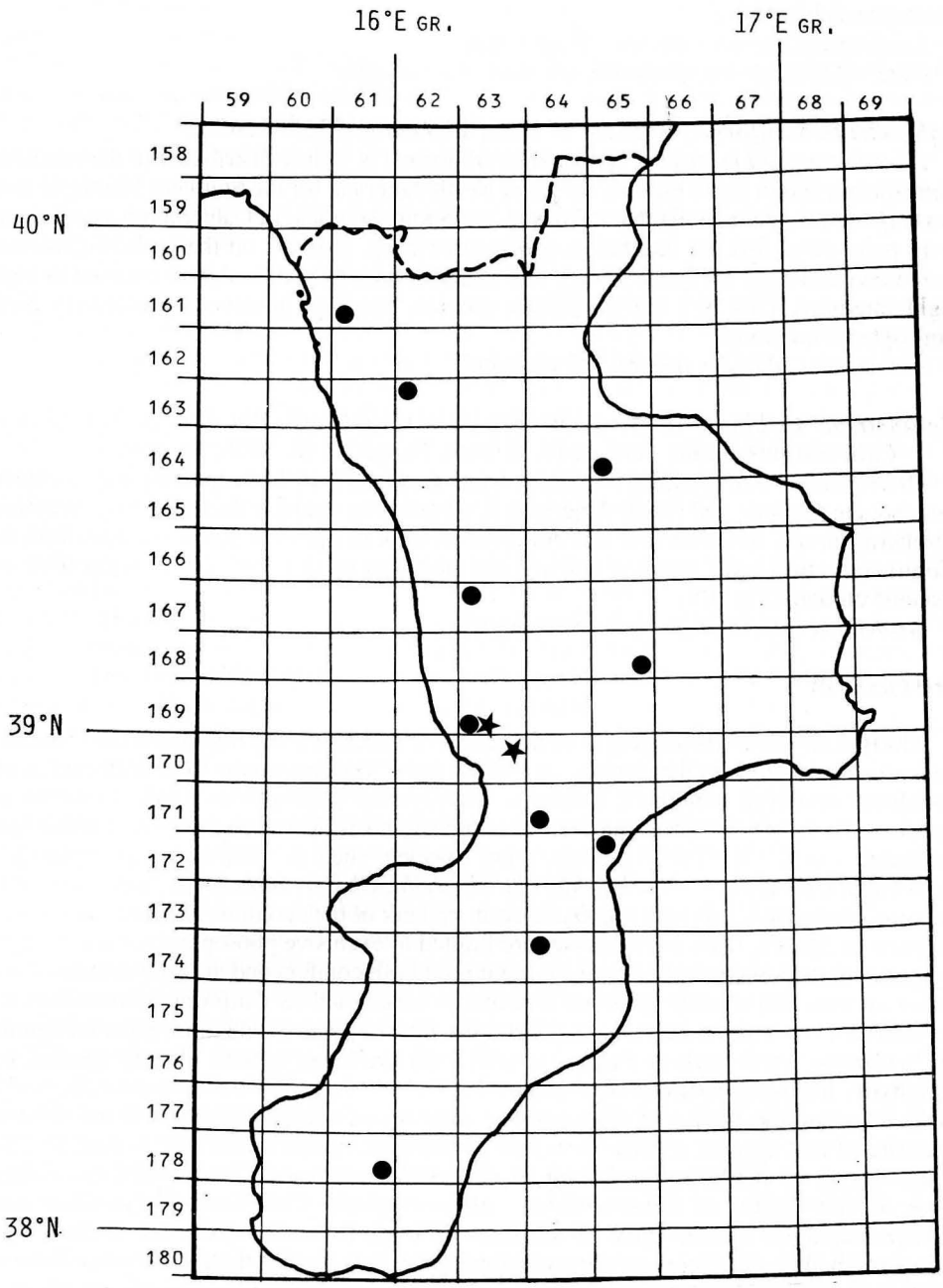

Fig. 30. Distribution of *Sphinctrina tubiformis* (stars) and *Sphinctrina turbinata* (circles) in Calabria.

Massives, see Fig. 29) both on the bark of conifers (*Abies alba* and *Pinus leucodermis*) and on acid rocks, together with mosses, especially in high mountains with very high atmospheric humidity.

Associated Caliciales species. - None found.

Note. - All Calabrian specimens are without ascocarps.

Sphinctrina tubiformis Massal. in Mem. Lichenogr.: 155. 1863.

Distribution and ecology. - *Sphinctrina tubiformis* is widely distributed in the northern hemisphere, occurring in Europe, Asia and North America; for the Southern Hemisphere it was reported from Australia, New Zealand and South America. In Calabria it was collected only twice (Fig. 30), on the thallus of *Pertusaria* sp. growing on the bark of *Quercus pubescens* and *Olea europaea* at very low altitudes (less than 300 m), and exposed to high light intensity. This is a thermophilous species, needing, however, a relatively high atmospheric humidity.

Associated Caliciales species. - None found.

Sphinctrina turbinata (Pers. ex Fr. :Fr) De Not. in Giorn. Bot. Ital. 2: 314. 1846 ≡ *Calicium turbinatum* Pers. ex Fr., Elench. Fung. 2: 148. 1828, Fr., ibid.

Distribution and ecology. - *Sphinctrina turbinata* is known from the northern hemisphere (Europe and North America). It seems to be strongly declining in central and northern Europe. In Calabria it was collected on bark of old trees (*Quercus dalechampii*, *Fagus sylvatica* and *Castanea sativa*) and on twigs of *Quercus ilex* in areas with an oceanic climate (Fig. 30).

Associated Caliciales species. - None found.

Discussion

Thirty-five species belonging to eight genera of *Caliciales* are reported from Calabria, seventeen being new to this region, and two to Italy. The specimens were collected in 66 localities scattered troughout Calabria. Twenty-two phorophytes (Tab. 1) serve as substrate for epiphytic species or their intermediate hosts. Most species have a rather low substrate specificity (Tab. 1). Thus, some species, such as *Calicium adspersum*, *C. salicinum*, *Chaenotheca brachypoda*, *Ch. chlorella*, *Ch. ferruginea*, *Ch. furfuracea*, *Ch. phaeocephala* and *Cyphelium inquinans* occur on bark of both conifers and deciduous trees, or even on lignum. Only a few species are limited to exclusive phorophytes. *Chaenotheca xyloxena* almost exclusively occurs on lignum, of both conifers and deciduous trees; some other species that usually grow on coniferous bark, such as *Calicium glaucellum*, *C. salicinum*, *Chaenotheca chrysocephala*, and *Ch. phaeocephala*, sometimes grow on lignum of "vicarious" trees such as *Fagus sylvatica* and *Castanea sativa*. Thirthy species are epiphytic, including parasites-saprophytes on various trees. *Chaenothecopsis pusiola* is only found on the thallus of *Chaenotheca brunneola*, suggesting that it is an obligate parasite of that species. *Chaenothecopsis epithallina*, which Tibell (1975) described as "growing on the thallus or rarely stalk of *Chaenotheca trichialis*"' was found in Calabria also on the thallus of *Chaenotheca phaeocephala*. *Calicium corynellum* and *Chaenothecopsis exserta* grow on siliceous rocks under overhangs or on vertical clipp faces in shaded situations, as parasymbiontic/parasites on the thalli of leprose lichens (often on *Haematomma ochroleucum*). *Chaenotheca furfuracea* and *Microcalicium arenarium* grow well protected in niches of roots or under overhangs, where there is a stable microclimate with constant humidity and light intensity. Sometimes *Chaenotheca furfuracea* and *Microcalicium arenarium* were found on soil and rocks, but always in niches well protected from rain. *Calicium glaucellum* and *Calicium salicinum* are usually

lignicolous, but sometimes they also occur on bark. Some species usually are corticicolous, such as *Chaenotheca trichialis*, *Cyphelium karelicum* and *Cyphelium inquinans*, but, although more rarely, they also occur on lignum. The genus *Sphinctrina* does not appear to be experiencing the same pronunced decline in Calabria as in other parts of Europe (Löfgren & Tibell 1979). *Sclerophora nivea* was found only on the bark of old trees *Quercus dalechamphii*, *Castanea sativa* and very old *Hedera helix* in open forests with high light intensity and atmospheric humidity. Some *Mycocaliciaceae* (*Chaenothecopsis debilis, Ch. pusilla* and *Mycocalicium parietinum*) occur directly on lignum, and also in relatively dry localities. Some *Chaenothecopsis* species are parasites on other lichens or on free-living colonies of algae. *Sphaerophorus globosus* occurs on a variety of substrata, like bark, rock and soil.

Caliciales show a great deal of morphological variation. Many species (*Calicium adspersum*, *Calicium salicinum*, *Calicium viride*, *Chaenotheca chrysocephala*, *Chaenotheca phaeocephala*, *Chaenotheca trichialis* and *Cyphelium inquinans*) may have very long-stalked, or almost sessile apothecia. The thallus is sometimes very thick (on trunks of deciduous trees as *Quercus* and *Castanea*) or is immersed (on lignum of coniferous trees). The thallus is thicker also in relatively open situations, and very thin in shaded sites. Also the colour of the thallus, the pruina on the upper part of capitula, the anatomy of the apothecia may be very variable. Light intensity, the pH of the substratum and its water capacity may be important for these variations as well.

Most species of *Caliciales* grow near the base of old trunks, preferably at the edge of bark fissures in sites with rain-free, damp air, without direct sunlight, much diffuse light, constant humidity, such as at the north edge of woods bordering marshes, bogs, rivers and rivulets. Most species avoid direct precipitation and prefer habitats with moist, stable microclimatic conditions. On fissured bark *Caliciales* often colonize only crevices, and only in more humid sites and on very old trunks are they able to extend onto the smooth plates of the bark, in contact with *Graphidion* communities.

Other ecological factors are important for *Caliciales*. Middelborg & Mattsson (1987) reported that in Norway microclimatic humidity and not precipitation is the most important factor conditioning the distribution of *Caliciales* species. Tibell (1980) report that some species are rare in very humid areas of northwestern Europe and western North America. Also in Calabria microclimate is the most important factor for *Caliciales*. Most species of *Caliciales* grow in sheltered localities with high humidity and often low light intensity. For explaining the distribution of *Caliciales* species in Calabria, the most important ecological factor is the atmospheric moisture.

Most species are confined to oceanic-suboceanic areas and restricted to ancient woodland sites with a long-lasting ecological continuity (constantly high humidity maintened by continuous cover of the tree canopy for many centuries).

The distribution maps in Calabria show that in this region most *Caliciales* are more frequent in the mountains (Fig. 4), sometimes ascending to the tree line. Many species are distributed in areas above 800 m, with high yearly precipitations (more than 1000 mm), and with a very short arid period in summer (with little rain, but with frequent condensation phenomena). Only a few species seem to be sensitive to temperature, needing relatively low winter temperatures, such as *Chaenotheca hispidula* and *Sphinctrina tubiformis*. Only a few *Caliciales* occur at low altitudes in Calabria, because of the higher evap-traspiration and higher summer temperatures, which disallow constant humidity of the atmosphere. Only in particularly sheltered sites, such as deep valleys with thermic inversion or some primeval Mediterranean forests, a few *Caliciales* can still be found.

Temperature does not play an important role in determing the zonal distribution of these species. In the Sila Massif, whose climate has brief winter frost periods and high precipitations, many species of *Caliciales* were found.

Table 1. Phorophytes and their *Caliciales* hosts.

	Taxus baccata lignum	Sequoia sempervirens cortex	Quercus pubescens lignum	Quercus pubescens cortex	Quercus ilex lignum	Quercus ilex cortex	Quercus dalechampii lignum	Quercus dalechampii cortex	Quercus cerris lignum	Quercus cerris cortex	Pyrus amygdaliformis lignum	Prunus cocomilia lignum	Prunus ceranus cortex	Populus tremula lignum	Picea excelsa cortex	Pinus leucodermis lignum	Pinus leucodermis cortex	Pinus laricio lignum	Pinus laricio cortex	Ostrya carpinifolia lignum	Ostrya carpinifolia cortex	Olea europaea lignum	Olea europaea cortex	Larix decidua cortex	Hedera helix cortex	Fagus sylvatica lignum	Fagus sylvatica cortex	Castanea sativa lignum	Castanea sativa cortex	Alnus glutinosa cortex	Alnus cordata lignum	Alnus cordata cortex	Abies alba lignum	Abies alba cortex
Calicium abietinum							●																					●						
Calicium adspersum								●		●								●	●									●	●					●
Calicium glaucellum	●	●					●				●					●		●	●			●				●		●	●			●		
Calicium quercinum																												●						
Calicium salicinum	●						●	●	●	●		●						●								●	●	●	●	●		●	●	●
Calicium viride																●	●	●						●				●				●	●	
Chaenotheca brachypoda						●												●								●	●					●	●	
Chaenotheca brunneola	●				●													●	●									●				●		
Chaenotheca chlorella																		●	●	●						●	●			●		●		●
Chaenotheca chrysocephala		●																	●					●					●					●
Chaenotheca ferruginea															●			●	●					●										
Chaenotheca furfuracea						●		●		●						●		●	●							●	●	●	●	●		●		●
Chaenotheca hispidula			●	●						●																		●	●					●
Chaenotheca laevigata																																		●
Chaenotheca phaeocephala				●											●			●	●									●	●		●	●	●	●
Chaenotheca trichialis	●																	●	●		●			●			●		●	●		●		●
Chaenotheca xyloxena																		●								●						●		
Chaenothecopsis epithallina																											●							
Chaenothecopsis debilis			●		●	●	●		●									●								●	●							●
Chaenothecopsis pusilla					●	●																●						●						
Chaenothecopsis pusiola								●										●														●		
Cyphelium inquinans																●	●	●																●
Cyphelium karelicum																																		●
Cyphelium pinicola																			●															
Cyphelium sessile																						●							●					
Microcalicium arenarium																			●								●		●					●
Mycocalicium parietinum						●		●		●								●				●				●						●		
Sclerophora nivea								●																	●				●					
Sclerophora peronella																										●	●						●	●
Sphaerophorus globosus																	●																	●
Sphinctrina tubiformis				●																		●												
Sphinctrina turbinata				●		●		●		●			●									●					●		●					●

Caliciales species form complex communities with several species (in one tree ten *Caliciales* species were found). Barkman (1958) suggested that the optimum for *Caliciales* is in continental, not oceanic regions as stated by Klement (1955). Often they grow on well-decomposed lignum, which is softer, more acid, and has a higher water capacity (Barkman 1958).

Many species are heliophobous and not photophobous, or rather anheliophytic and are most frequent in shaded situations or in diffuse light, without direct sunlight.

It is interesting to note that several *Caliciales* have a wide range of distribution. The vast majority of species is cosmopolitan or wide-ranging in cold-temperate to warm-temperate areas of both emispheres, gradually ascending to upland areas toward the equatorial mountains.

Tibell (1980) suggested that *Caliciales* are very sensitive to changes in forest climate. Many species depend on mature forests containing trees of different ages and a varied light and humidity regime. In Calabria wide areas were cut-clean, and replanted with domesticated trees such as *Castanea sativa* and *Olea europaea*. These plantations, however, are centuries old. Many *Caliciales* have recolonized mature secondary woodlands planted as far back as medieval times.

Calabria has a well-developed *Caliciales* flora confined to relatively high altitudes. The suboceanic to hyperoceanic climate, the conservation of some old forests, the rugged morphology and the relative absence of pollution are responsible for the rich *Caliciales* flora. The most important unfavourable factors limiting the distribution of these very sensitive lichens seem to be insufficient air humidity, strong illumination, lack of ecological continuity of forest and pollution. Conservation measures should be taken to protect the primeval forests of Calabria, and also the "artificial woodlands" (chestnut and olive woods) hosting many lichen species that in large areas of Europe are now on the way to extinction.

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Appendix - Localities of collection

Calicium abietinum Pers.

Cozzo del Pesco (Sila Greca, CS), lignum, *Quercus dalechampii*, 1000 m (CLU 5024, 5025); Valle del Fiume Caronte (Catena Costiera, CS), lignum, *Castanea*, 720 m (CLU 433).

Calicium adspersum Pers.

Varco del Trave (Fagnano Castello, CS), bark, *Castanea*, 675 m (CLU 8177); Valle del Fiume Caronte (Catena Costiera, CS) on bark and lignum of *Castanea*, 650 m (CLU 1841, 1849, 1870, 1971, 2088, 2669, 2672, 2676, 2677, 2678, 3058, 3207, 3284, 6585, 6586, 6587, 6588, 6600); Piano del Medico (Carpanzano, Sila Grande, CS), bark, *Castanea*, 1017 m (CLU 2827, 2828, 2829, 2830, 2831, 2832, 2833, 2834, 2835, 2836, 2837, 2843, 2893, 2895, 3227, 3230, 3254, 3255, 6599, 6608, 6609, 6612); Monte Gariglione (Sila Piccola, CZ), bark, *Abies*, 1650 m (CLU 2119); Rizzuto (Mendicino, CS), bark, *Castanea*, 720 m (CLU 2592, 2598, 6591); Valle del Fiume Menta (Aspromonte, RC), bark, *Abies*, 1500 m (CLU 4740, 4746, 4747, 4759, 4761, 4762, 4776, 4789, 4790, 4791, 4814, 4815, 4883, 6583, 6598, 6610, 6611); Cozzo del Pesco (Sila Greca, CS), bark, *Quercus cerris* and *Castanea*, 990 m (CLU 3427, 3437, 3438, 3447, 4938, 4942, 5871, 5872, 5873, 5874, 5875, 5876); Rovito (Sila Grande, CS), bark, *Castanea*, 650 m (CLU 1918, 4181, 4182, 4183, 4184, 4185, 4186, 4188, 4189, 4190, 4191, 4192, 6584, 6592, 6593, 6594, 6595, 6613); Monte Sparviere (Alessandria del Carretto, CS), bark, *Abies*, 1690 m (CLU 3547).

Calicium corynellum (Ach.) Ach.

Vallone Fossiata (Sila Grande, CS) acid rock, 1320 m (CLU 5281); Valle Fiume Caronte (Catena Costiera, CS) acid rock, 560 m (CLU 3273, 3274, 3305); Montagna Grande (Sila Grande, CS) acid rock, 1450 m (CLU 3942); Colle Donato (Sila Grande, CS) acid rock, 1474 m (CLU 3943); Pietra Bianca (Sila Grande, CS) acid rock, 1350 m (CLU 5358, 5359).

Calicium glaucellum Ach.

Colle d'Ascione (Sila Grande, CS), bark, *Metasequoia sempervirens.*, 1350 m (CLU 2338); San Fili di Martirano (CZ), bark, *Castanea*, 870 m (CLU 4412); Gambarie di Aspromonte (RC), bark, *Pinus laricio*, 1150 m (6205); Valle del Fiume Tacina (Monte Gariglione, CZ), bark, *Pinus laricio*, 1450 m (CLU 8396); Piano del Medico (Carpanzano, CS), lignum, *Castanea*, 1017 m (CLU 2890); Monte Faggeto (Catena Costiera, Aiello C., CS), bark, *Pinus laricio*, 890 m (CLU 4169); Santo Janni di Redipiano (Sila Grande, CS), lignum, *Castanea*, 890 m (CLU 3176, 3178); Monte Gariglione (Sila Piccola, CZ), lignum, *Abies*, 1650 m (CLU 2278, 2279, 2280, 3389, 3416, 3419, 4134); Piano del Medico (Carpanzano, CS), lignum, *Castanea*, 1017 m (CLU 2891, 2889, 3215); Valle del Fiume Menta (Aspromonte, RC), lignum, *Abies*, 1500 m (CLU 4777); Rovito (Sila Grande, CS), lignum, *Castanea*, 650 m (CLU 4526); Pietra Bianca (Sila Grande, CS), bark, *Pinus laricio*, 1438 m (CLU 532); Serra delle Ciavole (Pollino, CS), lignum, *Pinus leucodermis*, 2000 m (CLU 2185); Pino Collito (Sila Grande, CS), lignum, *Pinus laricio* and *Fagus*, 1350 m (CLU 2287, 2621, 2634, 3936); Colle d'Ascione (Sila Grande, CS), bark, *Metasequoia sempervirens* 1350 m (CLU 2340); Valle del Fiume Tacina (Sila Piccola, CZ), bark, *Pinus laricio*, 1450 m (CLU 2348, 2349, 8379); Redipiano (Sila Grande, CS) on bark and lignum of *Castanea*, 850 m (CLU 2558, 3173); Serra del Prete (Pollino, CS), lignum, *Fagus*, 1900 m (CLU 2631); Valle del Fiume Caronte (Catena Costiera, CS), lignum, *Castanea* and *Pyrus amygdaloides*, 650 m (CLU 2674, 3295); Lardone (Sila Grande, CS), lignum, *Castanea*, 1360 m (CLU 2696); Varco San Mauro (Sila Grande, CS) on bark *Castanea*, 1240 m (CLU 3288, 3289, 3290, 3292); Cozzo del Pesco (Sila Greca, CS), lignum, *Quercus dalechampii*, 980 m (CLU 3432, 3436, 4994, 4550); Vallone Cecita (Sila Grande, CS), bark, *Pinus laricio*, 1158 m (CLU 3477); Craticello (Sila Grande, CS), lignum, *Castanea*, 1250 m (CLU 3935); Monte Faggeto (Catena Costiera, Aiello Calabro, CS), bark, *Pinus laricio*, 890 m (CLU 4168, 4176); Bosco di Gallopane (Sila Grande, CS), lignum, *Pinus laricio*, 1450 m (CLU 4890); Fonte Cardillo (Monti di Orsomarso, Lungro, CS), lignum, *Taxus baccata*, 1230 m (CLU 5698); Croce di Dio Sia Lodato (Aspromonte, RC), lignum, *Quercus dalechampii*, 1390 m (CLU 6186); Monte Palanuda (Monti di Orsomarso, CS), lignum, *Fagus*, 1610 m (CLU 6961); Serra di Novacco (Monti di Orsomarso, CS), lignum, *Fagus*, 1580 m (CLU 6969, 6970, 7140, 7161, 7162, 7163, 7165).

Calicium quercinum Pers.

Valle del Fiume Caronte (Catena Costiera, CS), lignum, *Castanea*, 620 m (CLU 1269, 1737, 1855, 2086, 2087, 2673, 2675, 2966, 2999, 3003, 3059, 3060, 3061, 3062, 3063).

Calicium salicinum Pers.

Monte Palanuda (Orsomarso, CS), lignum, *Fagus*, 1610 m (CLU 6971, 6972, 7196); Serra di Novacco (Saracena, CS), lignum, *Fagus*, 1580 m (CLU 7232, 7259); Timpone Fornelli (Orsomarso, CS), lignum, *Fagus*, 1190 m (CLU 7303, 7305); Schiena di Rossale (Saracena, CS), lignum, *Fagus*, 1280 m (CLU 7147, 7192); Coste d'Acine (Saracena, CS), lignum, *Fagus*, 1520 m (CLU 7156); Rifugio Conte d'Orlando (Mormanno, CS), lignum, *Fagus*, 1280 m (CLU 8006); Passo di Guardia (Cerzeto, CS) on bark *Castanea*, 1040 m (CLU 7863); Piano di Marco (Monte Mula, CS), bark, *Quercus cerris*, 1020 m (CLU 609); Vallone Margherita (Sila Grande, CS), bark, *Abies*, 1370 m (CLU 1091, 1364); Valle Fiume Caronte (Catena Costiera, CS), bark, *Castanea*, 650 m (CLU 1848, 1860, 2014, 2668, 2670, 2678, 3282, 8382, 8383, 8384); Camigliatello Silano (Sila Grande, CS), bark, *Pinus laricio*, 1325 m (CLU 1912); Monte Gariglione (Sila Piccola, CZ) on bark and lignum of *Abies*, 1650 m (CLU 1987, 1988, 2108, 2110, 2113, 2114, 2127, 2270, 2272, 2275, 2277, 2778, 2781, 2882, 2783, 3272, 3273, 4131, 6711, 8380); Serra del Prete (Pollino, CS), lignum, *Fagus*, m 1890 m (CLU 2585, 2593, 2594, 6665, 6666); Rizzuto (Mendicino, CS) on bark and lignum of *Castanea*, 720 m (CLU 2586, 2587, 2589, 2590, 2595, 2596, 2598, 8388); Valle del Fiume Menta (Aspromonte, RC) on lignum and bark of *Abies*, 1500 m (CLU 2721, 2722, 2723, 2724, 2725, 2746, 2747, 2748, 2749, 2750, 2752, 2753, 2754, 2757, 2785, 2787, 2792, 2793, 2795, 4760, 8386); Piano del Medico (Carpanzano, Sila Grande, CS), bark, *Castanea*, 1017 m (CLU 2895); Pietra Impiccata (Aspromnte, RC), bark, *Pinus laricio*, 1650 m (CLU 2956); Varco San Mauro (Sila Grande, CS), bark, *Castanea*, 1240 m (CLU 3192); Moschereto (Pollino, CS), lignum, *Fagus*,

1300 m (CLU 3265); Pollinello (Pollino, CS), lignum, *Fagus*, 1760 m (CLU 3345); Vallone Margherita (Sila Grande, CS), bark, *Abies*, 1540 m (CLU 3350); Cozzo del Pesco (Sila Greca, CS) on bark and lignum of *Quercus cerris* and *Quercus dalechampii* and bark of *Castanea*, 980 m (CLU 3433, 3449, 5036, 8385); Vallone Cecita (Sila Grande, CS) on lignum and bark of *Fagus*, 1150 m (CLU 3530, 3574, 3579, 6624, 6630, 6632, 6633, 6642, 6654); Monte Sparviere (Alessandria del Carretto, CS), bark, *Abies*, 1690 m (CLU 3549, 3550); Pita dell'Aglio (Sila Grande, CS), bark, *Alnus glutinosa*, *Abies* and, lignum, *Prunus cocomilia* and *Fagus*, 1320 m (CLU 3924, 3927, 3929, 3934, 6663, 8377, 8378); Valle del Torrente Moccone (Sila Grande, CS), lignum, *Fagus*, 1560 m (CLU 3949); Puntone Gramolara (Aspromonte, RC), lignum, *Quercus ilex*, 1430 m (CLU 4059, 4068); Monte Santa Lucerna (Catena Costiera, CS), bark, *Quercus cerris*, 910 m (CLU 4167, 4175); Il Monte (Grisolia, CS), bark, *Castanea*, 840 m (CLU 4389); Cava dell'Orso (Sila Grande, CS), bark, *Abies*, 1280 m (CLU 4571); Colle del Lupo (Sila Grande, CS), bark, *Fagus*, 1450 m (CLU 4825); Celico (Sila Grande, CS), bark, *Castanea*, 890 m (CLU 4857); Finaita (Sila Greca, CS), bark, *Castanea*, 1000 m (CLU 4992); Serra Ripollata (Sila Grande, CS), lignum, *Fagus* and, bark, *Quercus cerris*, 1620 m (CLU nr, 5363, 5406); Fonte Cardillo (Lungro, CS), lignum, *Taxus baccata*, 1250 m (CLU 5699); Piano di Marco (Monte Mula, CS), bark, *Quercus cerris*, 1020 m (CLU 6048); Peppamaio (Monte Fiorino, Satriano, CZ), bark, *Castanea*, 670 m (CLU 6115, 6116, 6119); Villaggio Canovai (Aspromonte, RC), lignum, *Fagus*, 1340 m (CLU 6176); Croce di Dio Sia Lodato (Aspromonte, RC), lignum, *Quercus dalechampii*, 1410 m (CLU 6187); Fiumarella di Rossale (Saracena, CS), lignum, *Fagus*, 1180 m (CLU 6555, 6557).

Calicium viride Pers.

Pietra Bianca (Sila Grande, CS), bark, *Pinus laricio*, 1400 m (CLU 532, 8539); Santo Janni di Redipiano (Sila Grande, CS) s, bark, *Castanea*, 890 m (CLU 3180); Valle del Fiume Tacina (Sila Piccola, CZ), bark, *Pinus laricio*, 1435 m (CLU 1025); Monte Gariglione (Sila Piccola, CZ), bark, *Pinus laricio* and *Abies*, 1650 m (CLU 2105, 2106, 2107, 2111, 2112, 2115, 2119, 2121, 2124, 2126, 2128, 2129, 2130, 2131, 2132, 2133, 2135, 2136, 2270, 2272, 2274, 2277, 3415, 8372, 8401, 8402, 8403, 8404, 8405); Valle Fiume Menta (Aspromonte, RC) on bark and lignum of *Abies*, 1560 m (CLU 2717, 2718, 2719, 2720, 2721, 2722, 2724, 2725, 4760, 4804, 4883, 8366); Vallone Cecita (Sila Grande, CS), bark, *Pinus laricio*, 1158 m (CLU 3454, 3455, 3465, 3467, 6625, 6626, 6627, 6634, 6635, 6636, 6643, 6647); Cuponello (Sila Grande, CS), bark, *Pinus laricio*, 1200 m (CLU 139); Fossiata (Sila Grande, CS), bark, *Pinus laricio* and *Larix*, 1320 m (CLU 944, 4300, 4326, 8406, 8407); Pietra Impiccata (Aspromonte, RC), bark, *Abies* and *Pinus laricio*, 1650 m (CLU 2156, 2157, 2727, 2728, 2731); Serra delle Ciavole (Pollino, CS), lignum, *Pinus leucodermis*, 1950 m (CLU 2569); Pollinello (Pollino, CS) on bark and lignum of *Pinus leucodermis*, 1760 m (CLU 3328, 3330, 3331, 3332, 3334, 3335, 3451, 3452, 4693); Santo Janni di Redipiano (Sila Grande, CS), lignum, *Castanea*, 1089 m (CLU 3174, 3181); Piano del Medico (Carpanzano, Sila Grande, CS), lignum, *Castanea*, 1100 m (CLU 3233, 3257); Monte Sparviere (Alessandria del Carretto, CS), bark, *Abies*, m 1690 (CLU 3547, 3548); Vallone di Cecita (Sila Grande, CS), bark, *Pinus laricio*, 1150 m (CLU 3565); Colle del Lupo (Sila Grande, CS), lignum, *Pinus laricio* and bark of *Abies*, 1450 m (CLU 4748, 4749); Cava dell'Orso (Sila Grande, CS), bark, *Abies*, 1250 m (CLU 4833).

Chaenotheca brachypoda Tibell

Timpone Camagna (Orsomarso, CS), bark, *Fagus*, 1230 m (CLU 5834); Valle del Torrente Cannavino (Sila Grande, CS), bark, *Abies*, 1540 m (CLU 3354); Pollinello (Pollino, CS), lignum, *Fagus*, 1760 m (CLU 3343); Valle del Torrente Moccone (Sila Grande, CS), bark, *Fagus*, 1260 m (CLU 4657); Camigliatello Silano (Sila Grande, CS), lignum, *Fagus*, 1210 m (CLU 4311, 8375); Fiumarella di Rossale (Saracena, CS), lignum, *Fagus*, 1180 m (CLU 6553, 6558, 6563); Masseti (Orsomarso, CS), bark, *Quercus ilex*, 950 m (CLU 7909).

Chaenotheca brunneola (Ach.) Müll. Arg.

Passo di Guardia (Cerzeto, CS), lignum, *Castanea*, 1040 m (CLU 7851, 7864); Silo (Catena Costiera, Falconara Alb., CS), lignum, *Fagus*, 890 m (CLU 7906, 7907); Valle del Fiume Menta

(Aspromonte, RC), lignum, *Abies*, 1560 m (CLU 2748, 2750, 2756, 2753, 2771, 2784, 2786, 2789, 4731, 4756, 4886); Monte Gariglione (Sila Piccola, CZ), lignum, *Abies*, 1650 m (CLU 699, 2109, 2110, 2137, 3368, 3369, 3417, 4132, 4133, 8376); Piano del Medico (Carpanzano, Sila Grande, CS), lignum, *Castanea*, 1000 m (CLU 2846, 2847, 2848, 2885, 3229, 3231); Valle del Fiume Caronte (Catena Costiera, CS), lignum, *Castanea*, 620 m (CLU 3058, 3454); Camigliatello Silano (Sila Grande, CS), lignum, *Pinus laricio*, 1280 m (CLU 2356); Vallone di Cecita (Sila Grande, CS), lignum, *Abies* and *Pinus laricio*, 1150 m (CLU 3474, 3475, 6622, 6628, 6629, 6644, 6645, 6646, 6649, 6653, 6655, 6659); Vallone Margherita (Sila Grande, CS), bark, *Abies*, 1540 m (CLU 3351); Fonte Cardillo (Lungro, CS), lignum, *Taxus baccata*, m 1230 (CLU 5697); Masseti (Orsomarso, CS), lignum, *Quercus ilex*, 950 m (CLU 7906, 7911, 7913); Fiumarella di Rossale (Saracena, CS), lignum, *Fagus*, 1150 m (CLU 7975, 7976).

Chaenotheca chlorella (Ach.) Müll. Arg.

Valle Fiume Menta (Aspromonte, RC), bark, *Abies* and *Alnus glutinosa* and lignum of *Abies*, 1500 m (CLU 3925, 4739, 4740, 4746, 4758, 4760, 4762, 4791, 4882, 6610); Colle del Lupo (Sila Grande, CS), bark, *Abies*, 1450 m (CLU 4825); Cava dell'Orso (Sila Grande, CS), bark, *Abies*, 1280 m (CLU 4858); Cozzo del Pesco (Sila Greca, CS), bark, *Quercus dalechampii*, 980 m (CLU 4936); Serra Ripollata (Sila Grande, CS), lignum, *Fagus*,, 1620 m (CLU 5361, 5362); Pita dell'Aglio (Sila Grande, CS), bark, *Alnus glutinosa*,, 1320 m (CLU 8377, 8378).

Chaenotheca chrysocephala (Turner ex Ach.) Th Fr.

Vallone Cecita (Sila Grande, CS), bark, *Pinus laricio*, 1150 m (CLU 3458, 3465, 3467, 3471, 3473, 3566, 3567, 3569, 5410, 5720, 5721); Monte Curcio (Sila Grande, CS), bark, *Larix*), 1750 m (CLU 3144, 3146, 3147, 3153, 3154, 3212, 3217, 4305); Camigliatello Silano (Sila Grande, CS), bark, *Pinus laricio*, 1325 m (CLU 1201, 1905, 1910, 1911, 1914, 1915, 4267, 4273, 6576, 6578, 8389, 8390); Pino Collito (Sila Grande, CS), bark, *Pinus laricio*, 1350 m (CLU 2300, 2301, 2307, 2310, 2312, 6572. 6573, 6577, 6580); Varco del Trave (Fagnano Castello CS), bark, *Castanea*, 580 m (CLU 8136, 8172, 8173); Lorica (Sila Grande, CS), bark, *Pinus laricio*, 1320 m (CLU 2320, 6574); Macchia di Pietra (Sila Grande, CS), bark, *Pinus laricio*, 1450 m (CLU 5342, 6575); Colle d'Ascione (Sila Grande, CS), bark, *Metasequoia sempervirens*, 1350 m (CLU 2345); Valle Torrente Moccone (Sila Grande, CS), bark, *Pinus laricio*, 1250 m (CLU 2614); Valle del Fiume Tacina (Sila Piccola, CZ), bark, *Pinus laricio*, 1440 m (CLU 5209); Pollinello (Pollino, CS), bark, *Pinus leucodermis*, 1760 m (CLU 3328).

Chaenotheca ferruginea (Turner ex Sm.) Migula

Monte Curcio (Sila Grande, CS), bark, *Larix*, 1750 m (CLU 3119, 3144, 3145, 3146, 3148, 3149, 3155, 3156, 3212, 3213, 3217); Vallone Cecita (Sila Grande, CS), bark, *Pinus laricio*, 1158 m (CLU 3458, 3476); Camigliatello Silano (Sila Grande, CS), bark, *Pinus laricio*, 1280 m (CLU 1909, 3193, 3195, 3252, 3260, 6571, 6581); Moccone (Sila Grande, CS), bark, *Pinus laricio*, 1320 m (CLU 3349); Serra delle Ciavole (Pollino, CS), lignum, *Pinus leucodermis*, 2000 m (CLU 2186); Pollinello (Pollino, CS), lignum, *Pinus leucodermis*, 1760 m (CLU 4693); Bosco Gallopane (Sila Grande, CS), lignum, *Pinus laricio*, 1450 m (CLU 4564).

Chaenotheca furfuracea (L.) Tibell

Vallone Margherita (Celico, CS), bark, *Castanea*, 1380 m (CLU 2269); Passo di Guardia (Catena Costiera, Cerzeto, CS), bark, *Fagus*, 1040 m (CLU 7843); Bosco di Stilo (Stilo, RC), bark, *Fagus*, 1110 m (CLU 7080, 7097); Coraci (Sila Grande, Colosimi, CS), bark, *Quercus pubescens*, 750 m (CLU 8397); Timpone Fornelli (Orsomarso, CS), bark, *Fagus*, 1150 m (CLU 6765); Camigliatello Silano (Sila Grande, CS), bark, *Pinus laricio* and lignum of *Fagus*, 1325 m (CLU 1901, 1902, 1903, 1906, 1913, 2354); Monte Gariglione (Sila Piccola, CZ) on bark and lignum of *Abies* and lignum of *Fagus*, 1650 m (CLU 1992, 3362, 3366); Pietra Impiccata (Aspromonte, RC), bark, *Abies*, 1650 m (CLU 2160, 2755); Fiego Suprano (Sila Grande, CS), lignum, *Fagus*, 1350 m (CLU 2259, 2416, 2417, 2418, 2428, 2429, 2430, 2906); Lorica (Sila Grande, CS), bark, *Pinus laricio*, 1320 m (CLU 2295); Pino Collito (Sila Grande, CS), bark,

Pinus laricio, 1350 m (CLU 2311); Colle d'Ascione (Sila Grande, CS), bark, *Quercus cerris* and *Pinus laricio*, 1350 m (CLU 2371, 2903, 8470); Bosco di Santa Maria (Serra San Bruno, CZ), bark, *Fagus*, 840 m (CLU 2372); Lardone (Sila Grande, CS), bark, *Fagus*, 1360 m (CLU 2695 2697, 2698); Piano del Medico (Carpanzano, CS) acid rock, 1100 m (CLU 3228); Valle del Fiume Caronte (Catena Costiera, CS), bark, *Castanea*, 560 m (CLU 3265, 3275, 3303); Pollinello (Pollino, CS), bark, *Pinus leucodermis*, 1760 m (CLU 3333, 3343); La Criste (Sila Grande, CS), lignum, *Fagus*, 1540 m (CLU 3347); Valle Torrente Moccone (Sila grande, CS), bark, *Pinus laricio*, 1350 m (CLU 4352); Cozzo del Pesco (Sila Greca, CS), bark, *Quercus dalechampii*, 890 m (CLU 3442); Vallone Cecita (Sila Grande, CS), bark, *Fagus* and *Pinus laricio*, 1158 m (CLU 3463, 3573, 4224); Pita dell'Aglio (Sila Grande, CS), bark, *Alnus glutinosa*, 1320 m (CLU 3930); Torrente Coppo (Sila Grande, CS), bark, *Alnus glutinosa*, 1310 m (CLU 3937); Monte Reventino (CZ), bark, *Alnus cordata*, 1380 m (CLU 4341); Piano Pulledro (Cozzo del Pellegrino, CS), bark, *Alnus glutinosa*, 1480 m (CLU 5042); Macchia di Pietra (Sila Grande, CS), bark, *Alnus glutinosa*, 1420 m (CLU 5343); Villaggio Canovai (Aspromonte, RC), bark, *Fagus*, 1354 m (CLU 6175, 8399); Puntone Gramolara (Aspromonte, RC), bark, *Quercus dalechampii*, 1240 m (CLU 6183); Fiumarella di Rossale (Saracena, CS), lignum, *Fagus*, 1232 m (CLU 7066); Monte Cucco (Simbario, CZ), bark, *Fagus*, 810 m (CLU 7085); Valle Fiume Menta (Aspromonte, RC), bark, *Abies*, 1500 m (CLU 8398); Valle Fiume Tacina (Sila Piccola), bark, *Pinus laricio*, 1450 m (CLU 2350).

Chaenotheca hispidula (Ach.) Zahlbr.

Vallone Brancato (Orsomarso, CS), bark, *Quercus virgiliana*, 380 m (CLU 7363, 7365, 7366, 7367, 7368, 7369, 7370); Mangone (Sila Grande, CS), bark, *Quercus pubescens*, 790 m (CLU 7802, 7811, 7812); Bosco di Santa Maria (Serra San Bruno, CZ), bark, *Abies*, 840 m (CLU 3479, 3480, 3482, 3483, 3484, 5151); Cozzo del Pesco (Sila Greca, CS), bark, *Quercus cerris*, 890 m (CLU 3437); Piano del Medico (Carpanzano, CS), bark, *Castanea*, 1020 m (CLU 5755).

Chaenotheca laevigata Nàdv.

Monte Gariglione (Sila Piccola, CZ), bark, *Abies*, 1670 m (CLU 3370).

Chaenotheca phaeocephala (Turner) Th. Fr.

Santo Janni di Redipiano (Sila Grande. CS), lignum, *Castanea*, 890 m (CLu 3176, 3178); Colle d'Ascione (Sila Grande, CS), bark, *Metasequoia sempervirerns* 1350 m (CLU 2344); Valle del Fiume Menta (Aspromonte, RC), lignum, *Abies* and *Pinus laricio*, 1500 m (CLU 4763, 4779); Pietra Bianca (Sila Grande, CS), lignum, *Pinus laricio*, 1400 m (CLU 5360); Torrente Coppo (Sila Grande, CS), lignum, *Alnus cordata*, 1560 m (CLU 3946); Fagnano Castello (CS), bark, *Castanea*, 580 m (CLU 8172, 8173); Valle del Fiume Caronte (Catena Costiera, CS), bark, *Castanea*, 650 m (CLU 1879, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 3261, 3263, 3266, 3271, 3276, 3277, 3278, 3294, 3296, 3297, 3299, 3300, 3301, 3304); Monte Gariglione (Sila Piccola, CZ), bark, *Abies*, 1650 m (CLU 2120, 2122); Santo Janni di Redipiano (Sila Grande, CS) on bark and lignum of *Castanea*, 890 m (CLU 2557, 3056, 8373); Rogliano (Sila Grande, CS), bark, *Quercus virgiliana*, 660 m (CLU 3322, 3325, 3326); Pollinello (Pollino, CS), bark, *Pinus leucodermis*, 1760 m (CLU 3328, 3330, 3331, 3332, 3335, 3452); Vallone di Cecita (Sila Grande, CS) on lignum and bark of *Pinus laricio* and bark of *Abies*, 1158 m (CLU 1590, 1591, 1592, 1593, 1594, 1595, 1596, 1598, 1599, 1611, 1612, 1613, 1614, 1615, 1616, 1617, 1618, 1619, 1620, 1621, 1622, 1623, 1624, 1625, 1626); Monte Sparviere (Alessandria del Carretto, CS), bark, *Alnus cordata*, 1650 m (CLU 3533); Rovito (Sila Grande, CS), bark, *Castanea*, 650 m (CLU 4187); Bosco di Gallopane (Sila Grande, CS) on lignum and bark of *Pinus laricio* and lignum of *Populus tremula*, 1450 m (CLU 4566, 4602, 4889, 8374); Colle del Lupo (Sila Grande, CS), lignum, *Pinus laricio*, 1450 m (CLU 4748); Cava dell'Orso (Sila Grande, CS), bark, *Abies*, 1280 m (CLU 4567, 4862, 4863).

Chaenotheca trichialis (Ach.) Th. Fr.

Passo di Guardia (Cerzeto, CS), bark, *Castanea*, 1040 m (CLU 7863); Camigliatello Silano (Sila Grande, CS), bark, *Pinus laricio* and *Fagus*, 1250 m (CLU 1201, 1900, 1904, 1906, 1907,

1908, 1910, 1914, 1915, 1917, 2354, 2357, 3194, 3195, 4515, 4265, 4266, 4271); Pino Collito (Sila Grande, CS), bark, *Pinus laricio*, 1350 m (CLU 2283, 2284, 2285, 2290, 2291, 2292, 2302, 2303, 2304, 2305, 2311, 2312, 6580, 8469); Lorica (Sila Grande, CS), bark, *Pinus laricio*, 1320 m (CLU 2293, 2294, 2296, 2297, 2298, 2320); Torrente Moccone (Sila Grande, CS), bark, *Pinus laricio*, 1350 m (CLU 2615, 3349); Monte Curcio (Sila Grande, CS), bark, *Larix*, 1750 m (CLU 3212, 3215); Valle del Fiume Caronte (Catena Costiera, CS), bark, *Castanea*, 600 m (CLU 3298); Pollinello (Pollino, CS), bark, *Pinus leucodermis*, 1760 m (CLU 3330); Monte Gariglione (Sila Piccola, CZ), bark, *Abies*, 1670 m (CLU 3365, 3418); Vallone di Cecita (Sila Grande, CS), bark, *Pinus laricio* and *Fagus*, 1158 m (CLU 3458, 3465, 3470, 3529, 3531, 3571, 3572, 3573, 3580); Monte Sparviere (Alessandria del Carretto, CS), bark, *Alnus cordata*, 1650 m (CLU 3533); Torrente Coppo (Sila Grande, CS), bark, *Alnus glutinosa*, 1360 m (CLU 3919); Pita dell'Aglio (Sila Grande, CS), bark, *Alnus glutinosa*, 1320 m (CLU 3940); Rovito (Sila Grande, CS), bark, *Castanea*, 650 m (CLU 4524, 4525); Valle Fiume Menta (Aspromonte, RC), bark, *Abies*, 1550 m (CLU 4746, 4789, 4790, 4791); Cava dell'Orso (Sila Grande, CS), bark, *Abies*, 1250 m (CLU 4832, 4833, 4858, 4864); Bosco di Gallopane (Sila Grande, CS), lignum, *Pinus laricio*, 1450 m (CLU 4887); Cozzo del Pesco (Sila Greca, CS), bark, *Quercus dalechampii*, 890 m (CLU 4915); Fonte Cardillo (Lungro, CS), lignum, *Taxus baccata*, 1230 m (CLU 5702); Vallone Margherita (Celico, Sila Grande, CS), bark, *Abies*, 1480 m (CLU 6076).

Chaenotheca xyloxena Nàdv.

Serra delle Ciavole (Pollino, CS), lignum, *Pinus leucodermis*, 2000 m (CLU 2184); Monte Gariglione (Sila Piccola, CZ), lignum, *Abies*, 1670 m (CLU 3361, 3390, 3422, 3423, 3513, 3514); Valle del Fiume Menta (Aspromonte, RC), lignum, *Abies*, 1500 m (CLU 4735); Cava dell'Orso (Sila Grande, CS), lignum, *Pinus laricio*, 1280 m (CLU 4884, 4885); Torrente Coppo (Sila Grande, CS), lignum, *Fagus*, 1360 m (CLU 8408); Camigliatello Silano (Sila Grande, CS), lignum, *Pinus laricio*, 1250 m (CLU 4320).

Chaenothecopsis debilis (Turner & Borrer) Tibell

Rifugio Conte d'Orlando (Mormanno, CS), lignum, *Fagus* 1280 m (CLU 8006); Monte Palanuda (Orsomarso, CS), lignum, *Fagus*, 1610 m (CLU 6974, 7149, 7155); Coste d'Acine (Saracena, CS), lignum, *Fagus*, 1520 m (CLU 7044); Masseti (Orsomarso, CS), bark, *Quercus pubescens*, 950 m (CLU 7908, 7919); Valle del Fiume Menta (Aspromonte, RC), bark, *Abies*, 1500 m (CLU 4729); Valle del Fiume Menta (Aspromonte, RC), lignum, *Abies*, 1500 m (CLU 4736, 4758, 4760, 4776, 4808, 4816); Passo Gaudolino (Pollino, CS), lignum, *Fagus*, 1680 m (CLU 2218, 3123, 3270, 3271, 4201); Colle Impisu (Pollino, CS), lignum, *Fagus*, 1650 m (CLU 2988, 3268, 3269); Pollinello (Pollino, CS), lignum, *Fagus*, 1760 m (CLU 3344); Cozzo del Pesco (Sila Greca, CS), lignum, *Quercus dalechampii* 890 m (CLU 3433, 3434); Torrente Coppo (Sila Grande, CS), lignum, *Fagus*, 1360 m (CLU 3931, 3950); Pita dell'Aglio (Sila Grande, CS), lignum, *Fagus*, 1320 m (CLU 3948, 3964); Cava dell'Orso (Sila Grande, CS), lignum, *Fagus* and, bark, *Abies*, 1250 m (CLU 4512, 4569, 4865, 4869); Cozzo del Pellegrino (San Donato di Ninea, CS), bark, *Fagus*, 1500 m (CLU 5041); Cozzo del Mangano (San Donato di Ninea, CS), lignum, *Fagus*, 1460 m (CLU 5309); San Donato di Ninea (CS), lignum, *Quercus pubescens*, 210 m (CLU 5088, 5947); Valle Fiume Ferraina (Aspromonte, RC), lignum, *Fagus*, 1340 m (CLU 6177); Fiumarella di Rossale (Saracena, CS), lignum, *Fagus*, 1180 m (CLU 6554).

Chaenothecopsis epithallina Tibell

Colle del Lupo (Sila Grande, CS), bark, *Fagus*, 1450 m (CLU 4718, 4750, 4751, 4752, 4825).

Chaenothecopsis exserta (Nyl.) Tibell

Macchia di Pietra (Sila Grande, CS) acid rock, 1450 m (CLU 5405); Valle del Fiume Arente (Sila Grande, CS) acid rock, 240 m (CLU 6686); Rose (Sila Grande, CS) acid rock, 650 m (CLU 3221); Piano del Medico (Sila Grande, CS) acid rock, 1000 m (CLU 3232).

Chaenothecopsis pusilla (Floerke) A. Schmidt

Monte Montea (Sant'Agata d'Esaro, CS), lignum, *Fagus*, 1450 m (CLU 7917, 7931); Passo di Guardia (Catena Costiera, Cerzeto, CS), lignum, *Castanea*, 1040 m (CLU 7835); Valle Fiume Caronte (Catena Costiera, CS), lignum, *Castanea*, 650 m (CLU 1753, 2176, 2671, 2993, 2994, 2995, 2996, 2997, 2998, 3062, 3063); Piano del Medico (Carpanzano, CS), lignum, *Castanea*, 1017 m (CLU 2886, 3198, 3213, 3256); San Fili (Catena Costiera, CS), lignum, *Castanea*, 650 m (CLU 2958, 2968); Fagnano Castello (Catena Costiera, CS), lignum, *Castanea*, 640 m (CLU 3211); Camigliatello Silano (Sila Grande, VCS), lignum, *Pinus laricio*, 1280 m (CLU 3511); Puntone Gramolara (Aspromonte, RC), lignum, *Quercus ilex*, 1430 m (CLU 3601, 3615, 3616); Cozzo del Pesco (Sila Greca, CS), lignum, *Castanea*, 1000 m (CLU 4995); Peppamaio (Satriano, CZ) on lignum *Castanea*, 670 m (CLU 6113, 6114); Cittanova (RC), lignum, *Olea europaea*, 370 m (CLU 6172, 6173); Nocera Terenise (CZ), lignum, *Olea europaea*, 310 m (CLU 6814, 6815); Cinquefrondi (RC), lignum, *Olea europaea*, 290 m (CLU 7271).

Chaenothecopsis pusiola (Ach.) Vainio

Valle del Fiume Menta (Aspromonte, RC), lignum, *Abies*, 1560 m (CLU 2748, 2750, 2752, 2753, 4731); Monte Gariglione (Sila Piccola, (CZ), lignum, *Abies*, 1670 m (CLU 699, 2109, 2110, 3367, 3371, 3421, 3424).

Chaenothecopsis treicheliana (Stein.) Kalb

Macchia di Pietra (Sila Grande, CS), bark, *Pinus laricio*, 1450 m, (CLU 5417).

Cyphelium inquinans (Sm.) Trevisan

Valle Fiume Menta (Aspromonte, RC), bark, *Abies*, m 1560 (CLU 2723, 2754, 2717, 2718, 2719, 2720, 2721, 2722, 2724, 2725, 2726, 4757, 8366, 8368); Monte Gariglione (Sila Piccola, CZ), bark, *Abies*, 1740 m (CLU 2106, 2107, 2115, 2116, 2117, 2119, 2120, 2122, 2126, 2128, 2129, 2130, 2132, 2133, 2135, 2136, 2272, 2276, 2277, 3363, 3370, 4131, 4135, 4136, 8369, 8370, 8371, 8372); Pollinello (Pollino, CS), bark, *Pinus leucodermis*, m 1760 (CLU 3329, 3334); Vallone di Cecita (Sila Grande, CS) on lignum and bark of *Abies*, 1158 m (CLU 3460, 3461, 3464, 3466, 3468, 3469).

Cyphelium karelicum (Vainio) Räsänen

Monte Gariglione (Sila Piccola, CZ), bark, *Abies*, 1670 m (CLU 3370).

Cyphelium pinicola Tibell

Valle del Fiume Tacina (Sila Piccola, CZ), bark, *Pinus laricio*, 1440 m (CLU 5200).

Cyphelium sessile (Pers.) Mèrat

Cortale (CZ), lignum, *Olea europaea*, 380 m (CLU 8194, 8195, 8198, 8199, 8200, 8203); Piano del Medico (Carpanzano, CS), bark, *Castanea*, 1020 m (CLU 8367).

Microcalicium arenarium (Hampe ex Massal.) Tibell

Valle del Torrente Camigliati (Sila Grande, CS), bark, roots (*Pinus laricio*, *Fagus*), and acid rock 1250 m (CLU 2353, 2355, 3197, 3200, 3259, 3261, 3262, 4268, 4269, 4287); Valle del Torrente Mucone (Sila Grande, CS), bark, roots of *Fagus*, 1310 m (CLU 2613); Vallone Margherita (Celico, CS), bark, *Castanea* and *Fagus* in a niche near the soil, 1380 m (CLU 2269, 2772); Serra Nicolino (Catena Costiera, CS), bark, roots of *Fagus* and on acid soil, 870 m (CLU 7900, 7901, 7935); Sant'Angelo (Falconara Albanese, CS), bark, roots of *Fagus*, 920 m (CLU 6215); Gambarie d'Aspromonte (RC) acid rock, 1280 m (CLU 6180); Spezzano della Sila (CS) acid rock, 1200 m (CLU 2258); Pino Collito (Sila Grande. CS) acid rock, 1380 m (CLU 3939); Passo di Guardia (Catena Costiera, Cerzeto, CS) on root of *Fagus*, 104O m (CLU 7838);

Mycocalium parietinum (Ach. ex Schaer.) Hawskw.

Marcellinara (CZ), lignum, *Olea europaea*, 80 m (CLU 7464, 7468, 7469, 7469, 7470, 7471); Pietra Impiccata (Aspromonte, RC), lignum, *Abies* and *Quercus petraea*, 1620 m (CLU 2151, 2762, 2763, 2764, 2768, 8400); Cozzo del Pesco (Sila Greca, CS), lignum, *Quercus dalechampii* and *Castanea*, 1040 m (CLU 3428, 3430, 4539, 4926, 4990, 4991); Masseti

(Orsomarso, CS), lignum, *Quercus ilex*, 860 m (CLU 8055); Piano di Marco (Mula di San Donato di Ninea, CS), lignum, *Quercus cerris*, 1020 m (CLU 6092); Croce di Dio Sia Lodato (Aspromonte, RC), lignum, *Quercus petraea*, 1390 m (CLU 6206); Moschereto (Pollino, CS), lignum, *Fagus*, 1300 m (CLU 3263, 3264); Puntone Gramolara (Aspromonte, RC), lignum, *Quercus petraea*, 1430 m (CLU 3618, 3623, 4076); Serra delle Ciavole (Pollino, CS), lignum, *Pinus leucodermis*, 2000 m (CLU 2183, 3122); Butulli (Santa Caterina sullo Jonio, CZ), lignum, *Quercus frainetto*, 890 m (CLU 6120); Timpone del Pino (Lungro. CS), lignum, *Fagus* 1150 m (CLU 5954); Trepido' (Sila Grande, CS) on lignum if *Quercus dalechampii*, 1250 m (CLU 61080; Monte Sparviere (Alessandria del Carretto, CS), lignum, *Quercus cerris*, 1690 m (CLU 3521); Pietra Impiccata (Aspromonte, RC), lignum, *Abies*, 1620 m (CLU 2790).

Sclerophora nivea (Hoffm.) Tibell

Cozzo del Pesco (Sila Greca, CS), bark, *Quercus dalechampii*, *Hedera helix*, 910 m (CLU 3429, 3440, 3441, 3526, 3435, 3439, 3527, 3528, 4930, 4939).

Sclerophora peronella (Ach.) Tibell

Colle Impisu (Monte Pollino, CS), lignum, *Fagus*, 1650 m (CLU 2987, 2991); Monte Gariglione (Sila Piccola, CZ) on lignum of *Abies* and *Fagus*, 1670 m (CLU 3358, 3359, 3360, 4130); Monte Reventino (CZ), lignum, *Fagus*, 1410 m (CLU 4225, 4338, 4339); Pita dell'Aglio (Sila Grande, CS), lignum, *Fagus*, 1320 m (CLU 3944, 3945, 3947); Piano di Pulledro (San Donato di Ninea, CS), lignum, *Fagus*, 1500 m (CLU 5039, 5040); Valle Frassiliota (Orsomarso, CS), lignum, *Fagus*, 1500 m (CLU 6605, 6606, 6607); Piano di Novacco (Saracena, CS) on lignum of *Fagus*, 1310 m (CLU 6701, 7024); Macchia di Pietra (Sila Grande, CS), bark, *Fagus*, 1450 m (CLU 5341); Valle del Torrente Camigliati (Sila Grande, CS), lignum, *Fagus*, 1200 m (CLU 5659); Fiumarella di Rossale (Saracena, CS), lignum, *Fagus*. 1220 m (CLU 5700, 7975, 7976); Vallone di Cecita (Sila Grande, CS), lignum, *Fagus*, 1158 m (CLU 3462, 3472); Cava dell'Orso (Sila Grande, CS), bark, *Abies*, 1280 m (CLU 4573, 4872); Valle del Fiume Menta (Aspromonte, RC), lignum, *Abies*, 1500 m (CLU 4727); Timpone del Pino (Lungro, CS), lignum, *Fagus*, 1280 m (CLU 5585, 5586, 5955); Valle della Fossiata (Sila Grande, CS), bark, *Abies*, 1280 m (CLU 5282).

Sphaerophorus globosus (Hudson) Vainio

Monte Reventino (CZ) acid rock, 1416 m (CLU 4231, 4233, 4234, 4235, 4336, 4337, 4340, 4342); Pietra Impiccata (Aspromonte, RC), bark, *Abies* and acid rock, 1750 m (CLU 5132, 6613); Serra del Prete (Pollino, CS), bark, *Pinus leucodermis*, 1650 m (CLU 2228).

Sphinctrina tubiformis Massal.

Lamezia Terme (CZ) on *Pertusaria* growing, bark, *Quercus virgiliana*, 50 m (CLU 5423); Nocera Terinese (CZ), bark, *Quercus pubescens*, 280 m (CLU 3456).

Sphinctrina turbinata (Pers. ex Fr.) De Not.

Nocera Terinese (CZ) on *Pertusaria* growing, bark, *Olea europaea* and *Prunus cerasus*, 310 m (CLU 6804, 6805, 6807, 6808, 6809, 6813, 6816, 6820, 6844, 6848, 6850, 6851); Valle del Fiume Caronte (Mendicino, CS) on *Pertusaria* growing, bark, *Castanea*, 650 m (CLU 1914, 1969, 2666, 6787, 6788); Spuillace (CZ) on *Pertusaria* growing, bark, *Quercus pubescens*, 190 m (CLU 5577); Cozzo del Pesco (Sila Greca, CS) on *Pertusaria* growing, bark, *Quercus dalechampii*, 910 m (CLU 3443, 4925); Bosco di Santa Maria (Serra San Bruno, CZ) on *Pertusaria* growing, bark, *Abies*, 870 m (2367); Monte Gariglione (Sila Piccola, CZ) on *Pertusaria* growing, bark, *Abies*, 1670 m (CLU 3364); Piano di Marco (Monte Mula, CS) on *Pertusaria* on barkk of *Quercus cerris*, 1020 m (CLU 6047, 6089); Iacurso (CZ) on *Pertusaria*, bark, *Olea europaea*, 420 m (CLU 6008); Villaggio Canovai (Aspromonte, RC) on *Pertusaria* growing, bark, *Fagus*, 1354 m (CLU 6174, 6359); Timpone Mezzinare (Orsomarso, CS), bark, *Quercus ilex*, 890 m (CLU 8013).

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