식물학회지 제34권 제1호
Korean J. Bot. 34(1) : 77~90

Fungal Flora of Ullung Island (I)
—on Some Corticioid Fungi—

Jung, Hack Sung
(Department of Microbiology, College of Natural Sciences, Seoul National University, Seoul)

울릉도의 균류상 (I)
—수 종 고약균류에 관하여—

鄭 學 聲
(서울대학교 자연과학대학 미생물학과)

ABSTRACT

Fresh fungi were obtained during collection trips to Ullung Island in October, 1989, and August, 1990. Among them, some corticioid fungi were identified. Ten fungi were confirmed new to Korea and are recorded here with descriptions. They are *Athelia epiphylla, Grandinia alutaria, G. granulosa, G. stenospora, Cylindrobasidium evolvens, Hyphoderma radula, H. setigerum, Hypochnicium eichleri, Trechispora albo-ochracea,* and *T. farinacea.*

INTRODUCTION

Ullung Island is the largest island of the East Sea of Korea located at 130°52′ east longitude and 37°33′ north latitude. The administration district of the island belongs to the province Kyongsangbukdo and is 217 km away from Pohang. The island was made by a volcanic eruption between Tertiary and early Quaternary Periods and has a shape of pentagon with a length of 9.5 km, a width of 10 km, a circumference of 42 km, and an area of 73 km^2.

As a county of the province, Ullung Island consists of three townships, Nam-myon (which is now raised to the status of Ullung-up), Puk-myon, and So-myon, divided along the mountain ridges extending three ways from the summit of the island. Ullung Island has a rugged topography centering around Songinbong, the peak of the island with an altitude of 984 meters, and is usually surrounded by coastal bluffs except in the vicinity of several sea ports. A loop road around the island is now under construction along the coast but the construction has been hindered for a long time by natural obstacles of cliffs and steep slopes. The average land gradient of the island is 25° and there is no flat land except Nari Basin of Puk-myon township, so the land is drained well during rainy seasons but has a complex formation of forests on slopes and ridges.

Ullung Island has a typical oceanic climate characterized by warm temperature and high precipitation. Temperatures average around 12℃ throughout the year and precipitation amounts to 1,357 mm per year, the highest in the country. The island also has the heaviest snowfall in the country, with an annual average of 133 cm, and the land is covered with snow more than 70 days a year during winter. The island is densely forested with big trees everywhere above the altitude of 600 meters and is famous for the communal habitats of natural monuments like *Fagus crenata* var. *multinervis* (너도밤나무), *Pinus parviflora* (섬잣나무), *Tsuga sieboldii* (솔송나무), and *Juniperus chinensis* var. *procumbens* (섬향나무).

Thick virgin forests stand on steep slopes around Songinbong and provide rich native floras with sufficient substrate for fungal growth. But the floral study of higher fungi of Ullung Island has been very rare and the infor-

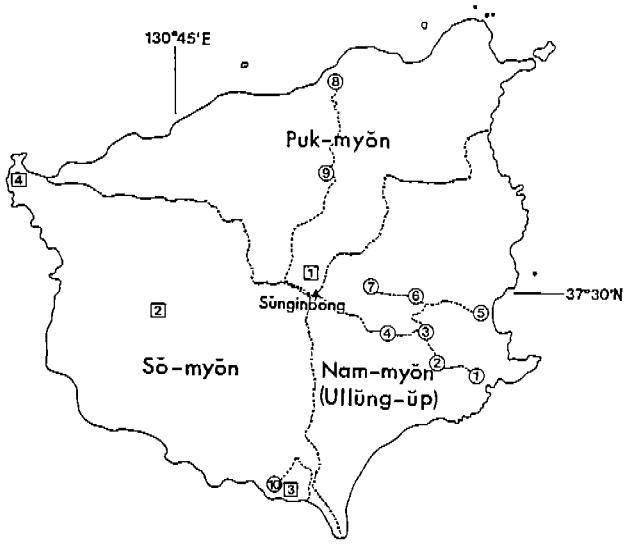


Fig. 1. Map of Ullung Island. — · — · —, myon boundary; · · · · · ·, survey course (① To-dong, ② Taewonsa, ③ 1st rest place, ④ 2nd rest place, ⑤ Cho-dong, ⑥ Chonyon Air-Con, ⑦ Pongrae Pokpo, ⑧ Chonbu, ⑨ Nari, ⑩ Tongkumi). [1] Virgin forest of Songinbong, [2] Communal habitat of *Tsuga sieboldii, Pinus parviflora,* and *Fagus crenata* var. *multinervis,* [3], [4] Natural habitats of *Juniperus chinensis* var. *procumbens.*

mation on their occurrence in this island has been wanting. The first report was made by Lee (1959), who studied specimens sent to him by a local collector and listed 16 species including two unrecorded fungi. Much later, Hong and Jang (1981) made a trip to the island and listed 58 species including four unrecorded species through the scientific survey of the Korean Association for Conservation of Nature. But these reports provided just simple lists of mushroom specimens the information of which seems to be rather fragmentary.

Ullung Island has been isolated for a long time phytogeographically and provides an ideal place to do a floral study just like a big botanical garden. A floral study of higher fungi in this area has been an increasing need. This study is intended to meet such a need by describing environments and ecology of fungi and listing fungal species through regular and systematic surveys of the island. When the island flora is compared with those of the mainland, there seem to be obvious floral differences between the island and the mainland. Therefore, this study is to be continued for a while in the hope that it will enable to draw a synthetic conclusion which can explain the fungal flora of Ullung Island and which can be compared to those of other islands or places of the country from the systematic and ecological point of view at the final stage of the study.

MATERIALS AND METHODS

Fresh fungi were collected during fruiting seasons from Ullung Island of the province Kyongsangbukdo. The first survey trip was made from October 12, 1989, for a week along the To-dong to Songinbong and the Cho-dong to Songinbong courses of Nam-myon. The second one was tried from August 6, 1990, for five days along the To-dong to Songinbong course of Nam-myon, the Chonbu to Songinbong course of Puk-myon, and the area around Tongkumi of So-myon. For the records of surveys, the Ullung minute series map No. NJ 52-10-29 published in 1989 by the National Geography Institute was used. A total of 175 mushroom collections, 107 during the first trip and 68 during the second trip respectively, were obtained along three courses and from one area of Ullung Island. They are deposited as dried specimens in the Herbarium of the Department of Microbiology, College of Natural Sciences, Seoul National University (SNU).

Soft materials which soon lose their morphological characters after collecting were observed briefly on the spot and were dried at the lodging inn by using a portable dryer. But tough or persistent materials were simply labelled on the memo pads and carried in a collecting bag and observed later after bringing to the laboratory. Out of the total collections, 62 turned out to be resupinate fungi mostly with smooth hymenophores and, among them, some corticioid fungi were identified to the species. Eleven species were identified and the first ten species were confirmed new to Korea and are furnished here with descriptions. They are *Athelia epiphylla, Grandinia alutaria, G. granulosa, G. stenospora, Cylindrobasidium evolvens, Hyphoderma radula, H. setigerum, Hypochnicium eichleri, Trechispora albo-ochracea,* and *T. farinacea,* and a recently published unrecorded species, *Grandinia breviseta* (Jung, 1989), is also classified in the genus and described here together.

For the observation of each specimen examined, a minute piece was taken under the stereomicroscope and mounted in alcoholic potash (1:1 3% KOH and 95% EtOH) and heated over a mild flame to rehydrate tissue and remove crystalline mass from the hymenium for better viewing (Jung, 1987). Normally, there were no striking difference in microscopic morphology between fresh and

revived materials, but KOH solution was used with care because it always causes the hyphal elements of brown fungi to darken and the encrustation of certain types of cystidial elements to dissolve. Reagents for chemical tests were prepared according to Largent *et al.*(1977). Fresh mounts were found to be best for study, but old mounts were also good enough to reuse and helpful in saving time.

For the description for each specimen examined, more than 10 measurements were usually made on each microscopic character. Basidiospore measurements were taken from hymenial squashes, but spore prints were sometimes used when the basidiospores were hard to find on hymenia. Basidia were measured from the basal septum to the base of the sterigmata, which were measured separately when useful for diagnosis. Width measurements were taken at the widest points. Wall thickness and projected parts were also measured when useful for diagnosis. Encrusted or capitulate tips were measured separately when necessary. Four categories were used to describe the wall thickness: thin-walled (0.6 μm or less), somewhat thick-walled (−0.8 μm), moderately thick-walled (−1.0 μm), and thick-walled (1.2 μm or more) (Jung, 1987). Length measurements of other elements like cystidia or hyphidia were sometimes troublesome when their starting points were deeply rooted in the subiculum or the trama. In such cases, approximate measurements were made, or other parts of a fruitbody were tried again.

TAXONOMY

The fungi collected from the mixed forests of Ullung Island belong to the taxa of the order Aphyllophorales most of which constitute a cosmopolitan group growing on dead wood and wood products throughout the world. As they are able to utilize wood as a substrate source by means of enzymatic digestions of wood cells, they are commonly called wood-rotting fungi. They represent a great diversity of morphology from simply built to highly organized structures and their fruitbodies are quite variable in many cases, becoming resupinate, reflexed, or completely pileate with or without a stipe.

Not only in gross morphology but also in microscopic structures, many forms of modified hyphae occur, so morphologically similar species are frequently proved to be quite different from one another under the microscope. Functions of these microscopic elements are interpreted in many ways and thus provide a taxonomic topic of increasing interest (Jung, 1987). All the materials to be reported here represent corticioid fungi with resupinate fruitbodies and are commonly equipped with smooth hymenophores although verrucose, odontoid, poroid, or ridged configurations are sometimes encountered.

The fungi treated here belong to the family Corticiaceae which is one of two large families, along with the family Polyporaceae, of the order Aphyllophorales. For the classification of the fungi, the subfamilies and genera are arranged according to the scheme of Parmasto (1968). The system of Eriksson and Ryvarden (1973, 1975, 1976) and Hjortstam *et al.*(1988) was frequently consulted for descriptions and the colored illustrations of Breitenbach and Kränzlin (1986) for reference. In pursuit of a modern systematic study, current scientific names have been tried as much as possible. Well-known keys (Eriksson and Ryvarden, 1973, 1975, 1976; Jülich and Stalpers, 1980) have been adopted but, in many cases, modified to the features of the fungi studied, in consideration of the possible differences of characters between Korean and foreign fungi. Genus descriptions are given here, on the basis of specimens studied, just because the genus is believed to be the basic taxon in natural grouping. The species descriptions are given in details and include available field informations. And the Romanization system for Korean proper names used in the text and field informations was quoted without using breves and apostrophes from the Korean Gazetteer publicized in January, 1984, by the Ministry of Education.

Family Corticiaceae
고약버섯科

Key to subfamilies of Corticiaceae

a. Basidia globose, subglobose, clavate, or urniform; hyphae often ampullate at septa……Sistotremoideae
a. Basidia narrowly to broadly clavate; hyphae not ampullate at septa……b
b. Hymenial layer forming a pellicle; basal hyphae loosely parallel to the substratum……Athelioideae
b. Hymenial layer usually appearing tomentose or pilose; basal hyphae rarely parallel to the substratum……Hyphodermoideae

Subfamily Athelioideae
부후고약버섯亞科 (新稱)

***Athelia* Pers. emend. Donk, Fungus 27:12, 1957. 부후고약버섯屬(新稱)**

Basidiocarp annual, resupinate, smooth, pellicular, soft,

easily separable. Hyphal system monomitic; hyphae hyaline, slender, thin-walled, septate, with or without clamps; basidia small, clavate, with 4 sterigmata; basidiospores hyaline, ellipsoid, smooth, not amyloid.

Type species: *Athelia epiphylla* Pers.

Remarks: This genus is characterized by its thin pellicular fruitbodies and non-amyloid spores.

1. *Athelia epiphylla* Persoon, Mycol. Europ. I:84, 1822. 부후고약버섯(新稱)(Plate 1-1, 3-A)

Basidiocarp resupinate, effused, white, yellowish, to cream-colored, smooth, pellicular, soft, easily detachable, thin, less than 0.1 mm thick.

Hyphae (1.5-) 2-5 μm wide; subhymenial hyphae comparatively narrower, septate, without clamps; basal hyphae septate, with predominant clamps; basidia (13-) 16-20×(4-) 5-6.5 μm, subcylindrical, with 4 sterigmata; basidiospores (4.5-) 5.5-7×3-4 μm, narrowly ellipsoid or ovate.

Habitat: frequent on humus, dead leaves, or fallen branches of *Alnus* or *Sambucus*.

Remarks: *A. epiphylla* is known as a species-complex showing a considerable variation in microscopic characters (Eriksson and Ryvarden, 1973). Ullung Island specimens have much shorter spores than those of references. This species seems to be a dominant one in moist habitats of Ullung Island.

Specimens: beyond the 1st rest place of To-dong to Songinbong course, Nam-myon, No. 891015-30, No. 891015-31; between the 1st and 2nd rest places of To-dong to Songinbong course, Nam-myon, No. 891015-44; Pongrae Pokpo, Nam-myon, No. 891017-70; across Chonyon Air-Con of Cho-dong to Songinbong course, Nam-myon, No. 891017-78, No. 891017-92.

Subfamily Hyphodermoideae 목재고약버섯亞科 (新稱)

Key to genera of Hyphodermoideae

a. Basidiospores<6 μm long·····*Grandinia*
a. Basidiospores>6 μm long·····b
b. Basidiospores lacrymoid, thin-walled, smooth, often agglutinated in groups·····*Cylindrobasidium*
b. Basidiospores globose to ellipsoid, thin- to thick-walled, smooth to asperulate, not agglutinated·····c
c. Basidiospores globose to broadly ellipsoid, thick-walled, smooth to verruculose, cyanophilous·····*Hypochnicium*
c. Basidiospores cylindrical to ellipsoid, thin-walled, smooth, not cyanophilous·····*Hyphoderma*

***Grandinia* Fries, Epicr. p. 527, 1838. 돌기고약버섯屬 (정학성, 자연보호중앙협의회 자연실태종합조사보고서 9: 83, 1989)**

Basidiocarp annual, resupinate, soft when fresh, firm when dry, adnate, thin; hymenial surface smooth, finely tuberculate, to odontoid; aculei small, conical, or cylindrical, apically pilose or penicillate due to projecting cystidia; margin usually not differentiated. Hyphal system monomitic; hyphae distinct, usually hyaline, septate, with clamps, somewhat loosely interwoven; subicular hyphae somewhat thick-walled, frequently branched; subhymenial hyphae thinner and denser; cystidia varying in shape and nature, hyphoid, differentiated, or conspicuous, often of two kinds; basidia small to medium in size, subclavate to subcylindrical, with a suburniform constriction, with 4 sterigmata; basidiospores hyaline, varying in shape, usually subglobose to ellipsoid, often with one or two oil drops within, smooth, not amyloid.

Type species: *Grandinia granulosa* (Pers.: Fr.) Fr.

Remarks: Many species of *Grandinia* are usually associated with conifers, but all the specimens from Ullung Island were found on hardwood substrates.

Microscopically, hyphae characteristically branch from clamps or the opposite of clamps and show cyanophilic reactions in cotton blue.

Key to species of *Grandinia*

a. With lagenocystidia·····*G. alutaria*
a. Without lagenocystidia·····b
b. Hymenial surface odontoid, with sparse aculei, visible between the aculei·····*G. granulosa*
b. Hymenial surface smooth, tuberculate, to odontoid, with dense aculei, hardly visible between the aculei·····c
c. Basidiospores subglobose or ellipsoid·····*G. breviseta*
c. Basidiospores allantoid or cylindrical···*G. stenospora*

2. *Grandinia alutaria* (Burt) Jülich, Int. J. Myc. Lich. 1:35, 1982. 둥근돌기고약버섯(新稱)(Plate 1-2, 3-B)

Basidiocarp resupinate, effused, confluent, soft and squeezable, becoming subceraceous with age, adnate, less than 0.1 mm thick; hymenial surface white or yellowish white at first, pale yellow, then grayish yellow, porose-reticulate, soon odontoid, with small aculei; aculei crowded, conical, apically pilose; margin pruinose, thinning outward or determinate.

Hyphae 2.5-4 (-4.5) μm wide, somewhat thick-walled, septate, with clamps, copiously branched; leptocystidia 70-90 (-110)×4-4.5 μm, hyphoid, abundant, frequently se-

ptate with clamps, apically rounded, often with intercalary constrictions, thin-walled to somewhat thick-walled, projecting up to 45 μm; lagenocystidia 15-20×3-4 μm, sagittate, ending in a needle-like tip provided with encrustation, slightly projecting; basidia 15×3.5-5 μm, subclavate, somewhat constricted in the middle, with 4 sterigmata; basidiospores 4.5-5.5×3.5-4.5 μm, broadly ellipsoid.

Habitat: uncommon on trunk or stump of dead *Betula* or unknown hardwood.

Remarks: Mature fruitbodies of this species are supposed to develop tuberculate to grandinioid hymenophores with semiglobose papillae (Eriksson and Ryvarden, 1976), but SNU specimens 891017-93 and 891017-105 were young ones without showing such characters.

Specimens: across Chonyon Air-Con of Cho-dong to Songinbong course, Nam-myon, No. 891017-93; 900 meters away from the summit of Cho-dong to Songinbong course, Nam-myon, No. 891017-105.

3. *Grandinia breviseta* (Karst.) Jülich, Int. J. Myc. Lich. 1:35, 1982. 흰돌기고약버섯(정학성, 자연보호중앙협의회 자연실태종합보고서 9:84, 1989)(Plate 1-3, 4-F)

Basidiocarp resupinate, effused, soft and thin, easily squeezed when fresh, adnate, less than 0.1 mm thick; hymenial surface white to yellowish white, furfuraceous, becoming odontoid, with small aculei; aculei dense, conical, apically penicillate; margin pruinose, thinning outward.

Hyphae 2-3 μm diam, septate, with clamps, copiously branched and intertwined; capitate leptocystidia 30-45×3-4 μm, very common, similar to sterile hyphal ends, often with intercalary enlargements, projecting up to 20 μm; torulose leptocystidia 55-70×4-5 μm, uncommon, submerged; basidia 15-20×4.5-5 μm, clavate, then subcylindrical with a constriction, with 4 sterigmata; basidiospores 4-5×3-3.5 μm, broadly ellipsoid.

Habitat: rare on a fallen branch of dead *Sambucus*.

Remarks: This species is known to occur usually on conifers and play an important role in decomposition of wood remains in conifer forests (Eriksson and Ryvarden, 1976). The SNU specimen was a young fruitbody found on *Sambucus* and must be a rare case for the species.

Specimens: across Chonyon Air-Con of Cho-dong to Songinbong course, Nam-myon, No. 891017-83.

4. *Grandinia granulosa* (Pers.: Fr.) Fries, Epicr. p. 610, 1838. 돌기고약버섯(新稱)(Plate 1-4, 1-5, 3-C)

Basidiocarp resupinate, effused, soft when fresh, firm and membranaceous when dry, adnate, 0.1 mm thick; hymenial surface yellowish white, smooth and continuous, then odontoid with small aculei, visible between the aculei; aculei up to 0.4 mm long, sparse, becoming dense, 2/mm to 3-4/mm, conical to subulate, obtuse to acute; margin white, pruinose or fimbriate, becoming entire.

Hyphae 2-3 μm diam, fairly constant in width, septate, with clamps, copiously branched and intertwined in the subiculum, denser and thinner and somewhat perpendicular to the surface in the subhymenium; leptocystidia 20-27×3.5-4 μm, common, similar to sterile hyphal ends, subulate, capitate, or somewhat torulose, often slightly projecting about 10 μm; basidia 15-18×4-5 μm, subclavate, then subcylindrical with a constriction, with 4 sterigmata; basidiospores (4.5-) 5-5.5×3.5-4.5 μm, broadly ellipsoid or ovoid.

Habitat: uncommon on fallen branches of dead *Acer* or unknown hardwood.

Remarks: Leptocystidia of *G. granulosa* are differentiated so little that they can be considered simply as cystidial hyphae or cystidioles (Eriksson and Ryvarden, 1976). This species is easily recognized due to its sparse and distinct aculei with naked eyes.

Specimens: across Chonyon Air-Con of Cho-dong to Songinbong course, Nam-myon, No. 891017-76; area around Araet Tongkumi, So-myon, No. 900808-57.

5. *Grandinia stenospora* (Karst.) Jülich, Int. J. Myc. Lich. 1:35, 1982. 털돌기고약버섯(新稱)(Plate 1-6, 3-D)

Basidiocarp resupinate, effused, soft and squeezable, adnate, less than 0.1 mm thick; hymenial surface yellowish white, then yellowish gray, furfuraceous, then odontoid with small aculei, loose and porose-reticulate between the aculei; aculei up to 0.5 mm long, conical, becoming crowded and accumulated into branched forms, apically penicillate; margin pruinose, indistinctly thinning outward or determinate.

Hyphae usually 3 μm wide, distinct, richly branched, septate, with clamps, sparsely branched in the aculeal trama, denser and thinner in the subhymenium; leptocystidia (35-) 50-75×5-6 μm, uncommon to common, cylindrical, obtuse, sometimes with several constrictions, projecting or enclosed; conidiophores present, 20-30×3-4 μm, subulate, with conidia of 12×4 μm size; basidia 15-20×5 μm, subclavate, then subcylindrical, often with a constriction in the middle, with 4 sterigmata; basidiospores 8-9×2-3 μm, allantoid.

Habitat: uncommon on a fallen branch or a log of *Sambucus* or *Cryptomeria*.

Remarks: This species is characterized by its allantoid spores and cylindrical cystidia. SNU No. 891015-43 has numerous conidiophores which resemble certain cystidioles (cf. *Hyphodontia alutacea* in Eriksson and Ryvarden,

1976) and frequently replace basidia and make the hymenium mostly sterile.

Specimens: between the 1st and 2nd rest places of To-dong to Songinbong course, Nam-myon, No. 891015-43; across Chonyon Air-Con of Cho-dong to Songinbong course, Nam-myon, No. 891017-95.

Cylindrobasidium **Jülich, Persoonia 8(1):72, 1974. 담자고약버섯屬(新稱)**

Basidiocarp annual, resupinate, soft, then membranaceous or subceraceous, adnate; hymenial surface smooth or tuberculate; margin fimbriate. Hyphal system monomitic; hyphae distinct, septate, with clamps, generally branched at clamps, with oil drops in the protoplasm; cystidia fusiform, thin-walled, not encrusted, enclosed or somewhat projecting; basidia narrowly clavate, with 4 sterigmata; basidiospores obliquely ellipsoid or lacrymoid, commonly agglutinated into groups of 2-4.

Type species: *Cylindrobasidium evolvens* (Fr.) Jül.

Remarks: Generic characters of *Cylindrobasidium* could be narrow and long basidia, oil-rich hyphae branching at clamps, and the shape of agglutinating spores (Eriksson and Ryvarden, 1976).

6. *Cylindrobasidium evolvens* (Fr.) Jülich, Persoonia 8 (1):72, 1974. 담자고약버섯(新稱)(Plate 2-1, 3-E)

Basidiocarp resupinate, initially orbicular, then confluent, subceraceous, adnate, thin, soon thickening up to 0.4 mm; hymenial surface yellowish white, turning cream-colored, smooth, becoming uneven or somewhat tuberculate; margin fimbriate, then disappearing.

Hyphae 3-5 μm wide, septate, with clamps, thin- to somewhat thick-walled, usually with oil drops in the protoplasm; subicular hyphae sparsely branched and loosely intertwined, rather straight and parallel to the substrate; subhymenial hyphae thinner and denser, vertically arranged; leptocystidia 55-80 (-95)×5-7.5 μm, fusiform, thin-walled, rather common, enclosed or slightly projecting; basidia 40-50×5-6 (-7) μm, narrowly clavate, with 4 sterigmata; basidiospores 8.5-10×5-6 μm, obliquely ellipsoid to lacrymoid, often agglutinated into groups of 2-4.

Habitat: rare on a fallen branch of dead *Sambucus*.

Remarks: This is known as a very common species (Breitenbach and Kränzlin, 1986) but is believed to be a rare one in Ullung Island. However, it can be recognized with ease thanks to the characteristic cystidia and spores.

Specimens: across Chonyon Air-Con of Cho-dong to Songinbong course, Nam-myon, No. 891017-89.

Hyphoderma **Wallroth emend. Donk, Fungus 27:13, 1957. 목재고약버섯屬(新稱)**

Basidiocarp annual, resupinate, ceraceous, adnate, thin to thickening; hymenial surface smooth, tuberculate, or odontoid. Hyphal system monomitic; hyphae hyaline, mostly thin-walled, septate, with clamps; subicular hyphae usually distinct, frequently branched; subhymenial hyphae crowded, densely branched; cystidia present in most species, differing in shape and nature, projecting or submerged, often encrusted; basidia comparatively large, narrowly clavate, constricted, with 4 somewhat curved sterigmata; basidiospores usually large, hyaline, ellipsoid, cylindrical, or allantoid, with oil drops within, smooth, not amyloid.

Type species: *Hyphoderma setigerum* (Fr.) Donk

Remarks: This genus is not so clearly defined as much as *Grandinia* and is considered rather heterogeneous (Eriksson and Ryvarden, 1975). However, several characters like the size and shape of cystidia, basidia, and spores will be useful in identification.

Key to species of *Hyphoderma*

a. Hymenium raduloid, with blunt teeth·····*H. radula*
a. Hymenium corticioid, smooth to odontoid with small or irregular teeth·····*H. setigerum*

7. *Hyphoderma radula* (Fr.) Donk, Fungus 27:15, 1957. 줄목재고약버섯(新稱)(Plate 2-2, 4-A)

Basidiocarp resupinate, orbicular at first, confluent on growing; hymenial surface whitish, creamish, or yellowish gray, initially corticioid, soon becoming tuberculate and verrucose, then cracking irregularly; margin usually white, finely fimbriate.

Hyphae mostly 2.5-3 (-4) μm wide, septate, with clamps, thin- to somewhat thick-walled, rather straight and sparsely branched in the subiculum, densely branched and closely interwoven in the subhymenium; cystidia 50-55×5-6 μm, becoming uncommon with age, tubular, cylindrical with some constrictions, or moniliform, usually enclosed; basidia 20-25×5-6 μm, subclavate to subcylindrical, often constricted, with 4 sterigmata; basidiospores 8×2.5-3 μm, allantoid.

Habitat: rare on a fallen branch of dead *Sambucus*.

Remarks: SNU No. 900807-48 looks like a young specimen of *H. radula* in all respects but morphologically has less distinct warts and microscopically smaller spores than those of references.

Specimens: near Songinbong of Chonbu to Songinbong course, Puk-myon, No. 900807-48.

8. *Hyphoderma setigerum* (Fr.) Donk, Fungus 27:15, 1957. 목재고약버섯(新稱)(Plate 2-3, 4-B)

Basidiocarp resupinate, orbicular, and confluent, subceraceous to ceraceous, andate, 0.1-0.2 mm thick; hymenial surface whitish, yellowish white, to pale yellow, porose-reticulate, soon continuous, often finely cracked, smooth, then finely tuberculate with semiglobose papillae; margin pruinose or farinose, thinning outward or determinate.

Hyphae distinct, 3.5-5 μm diam, thin- to relatively thick-walled (wall up to 1.0 μm thick), septate, with clamps, richly branched and densely interwoven in the subhymenium; cystidia 95-220 (-250)×8-11 (-12) μm, common, conspicuous, cylindrical, regularly septate, usually with clamps, thick-walled (wall about 1.0 μm thick) except the apical cell, at first naked, then often encrusted with pyramidal crystals, strongly projecting up to 80 μm; basidia 20-25 (-30)×5-7 μm, clavate to narrowly clavate, with a constriction, with 4 sterigmata; basidiospores 6.5-9×3-3.5 μm, cylindrical to suballantoid.

Habitat: common on fallen branches of dead *Alnus, Sambucus,* or unknown hardwood.

Remarks: This is a common corticioid fungus in hardwood forests and was collected from Ullung Island several times. *H. setigerum* can't be missed because of its huge and conspicuous septocystidia under the microscope.

Specimens: beyond the 1st rest place of To-dong to Songinbong course, Nam-myon, No. 891015-15; between the 1st and 2nd rest places of To-dong to Songinbong course, Nam-myon, No. 891015-50, No. 891015-52; between Nari Basin and Songinbong of Chonbu to Songinbong course, Puk-myon, No. 900807-24.

***Hypochnicium* John Eriksson, Symb. Bot. Upsal. 16(1): 100, 1958. 후막고약버섯屬(新稱)**

Basidiocarp annual, resupinate, ceraceous, often membranaceous when dry, adnate, thin; hymenial surface smooth or finely tuberculate; margin usually not differentiated. Hyphal system monomitic; hyphae hyaline, thin- to somewhat thick-walled, septate, with clamps; cystidia usually present, subcylindrical, projecting or submerged, smooth; basidia clavate to narrowly clavate, somewhat constricted, with 4 sterigmata; basidiospores hyaline, globose to ellipsoid, smooth or verruculose, thick-walled, with oil drops, not amyloid, cyanophilous.

Type species: *Hypochnicium bombycinum* (Sommerf. ex Fr.) John Erikss.

Remarks: This genus differs from other related genera wholly in the nature of spores whose walls are conspicuously thick and cyanophilous.

9. *Hypochnicium eichleri* (Bres.) Eriksson & Ryvarden, Cort. N. Europe 4:707, 1976. 흰후막고약버섯(新稱)(Plate 2-4, 4-C)

Basidiocarp resupinate, effused, ceraceous, adnate, up to 0.1 mm thick; hymenial surface yellowish white to creamish white, continuous, becoming smooth on drying; margin pruinose or determinate.

Hyphae distinct, about 3-4 μm diam, somewhat wider in the base, thin-walled, somewhat thick-walled in the base, septate, with clamps, irregularly branched in the subiculum, denser in the subhymenium; cystidia 90-110×6-10 μm, common, thin- to somewhat thick-walled, subcylindrical, broader around the middle, usually enclosed; basidia 25-35×7.5-9 μm, narrowly clavate, often constricted, with 4 sterigmata; basidiospores 8-9 (-10)×6-7.5 μm, globose to broadly ellipsoid, thick-walled, verruculose, cyanophilous.

Habitat: on a dead hanging branch of *Vitis.*

Remarks: It is said that *H. eichleri* shows a geographic difference in the spore size (Eriksson and Ryvarden, 1976). This species seems to be a rare one in Ullung Island and its host, *Vitis*, is apparently a rare case.

Specimens: across Chonyon Air-Con of Cho-dong to Songinbong course, Nam-myon, No. 891017-81.

Subfamily Sistotremoideae
포자고약버섯亞科 (新稱)

***Trechispora* Karst. emend. Liberta, Taxon 15:318, 1966. 미세고약버섯屬 (新稱)**

Basidiocarp annual, resupinate, arachnoid, byssoid, to waxy-membranaceous, fragile; hymenial surface even, odontoid, reticulate, or poroid. Hyphal system monomitic; hyphae hyaline or colored, thin-walled, septate, with clamps, often ampullate at septa; basidia short-clavate, with (2-) 4 sterigmata, infrequently pleurobasidial; basidiospores small, hyaline, globose, ellipsoid, echinulate, not amyloid.

Type species: *Trechispora onusta* Karst.=*Trechispora mollusca* (Pers.:Fr.) Liberta

Remarks: This taxon varies much in its shape and nature of hymenophore and texture but can be recognized with a little practice due to its unique microscopic characters like inflation of septa, presence of pleurobasidia, and ornamentation of spores (Hjortstam *et al.*, 1988).

Key to species of *Trechispora*

a. Basidiospores yellowish to light ochraceous, 4.5-7.5(-10)×3.5-5.5 μm, warted·····*T. albo-ochracea*

a. Basidiospores hyaline, 3-4(-4.5)×2.5-3(-3.5) μm, echi-

nulate·····*T. farinacea*

10. *Trechispora albo-ochracea* (Bres.) Liberta, Can. J. Bot. 51:1888, 1973. 황미세고약버섯(新稱)(Plate 2-5, 4-D)

Basidiocarp resupinate, effused, yellowish white, hypochnoid, becoming continuous; margin white, byssoid or fibrillose.

Hyphae 2-3 μm diam, thin- to somewhat thick-walled, septate, with clamps, often ampullate at septa up to 8 μm, with crystals scattered among hyphae; basidia 22-30 ×5-8 μm, clavate, with 4 sterigmata; basidiospores 4.5-6.5×3.5-4.5 μm, abundant, pale ochraceous, ovoid-ellipsoid to fusiform-ellipsoid, regularly warted.

Habitat: rare on the trunk of dead *Fagus*.

Remarks: For a confident identification, an authentic specimen needs to be examined for comparison, but the SNU specimen fits the description of Liberta (1973) very well.

Specimens: near the *Cryptomeria* forest before Pongrae Pokpo, Nam-myon, No. 891016-63.

11. *Trechispora farinacea* (Pers.:Fr.) Liberta, Taxon 15: 318, 1966. 분미세고약버섯(新稱)(Plate 2-6, 4-E)

Basidiocarp resupinate, effused, soft and squeezable, adnate, thin, 0.1 mm thick; hymenial surface yellowish white to cream-colored, farinose, colliculose, or odontoid, with small aculei; aculei up to 0.3 mm long, crowded, conical; margin pruinose to fibrillose, thinning outward.

Hyphae 2-3.5 μm diam, thin-walled, septate, mostly with clamps, often ampullate at septa up to 5 μm; basidia 10-15×4-5 μm, clavate, subclavate, to subcylindrical, sometimes pleurobasidial, with 2-4 sterigmata up to 4 μm long; basidiospores 3-4(-4.5)×2.5-3(-3.5) μm, ovoid, ovoid-ellipsoid, or subglobose, echinulate.

Habitat: uncommon on fallen branches of dead *Alnus*.

Remarks: Arthrospores which are supposed to be present in the hymenium in some cases (Liberta, 1973) were not confirmed in SNU specimens.

Specimens: beyond the 1st rest place of To-dong to Songinbong course, Nam-myon, No. 891015-19, No. 891015-32.

CONCLUSION

Some corticioid fungi collected from Ullung Island in October, 1989, and August, 1990, were identified to the species and classified according to recent systematic schemes. They represented 11 species of 6 genera in 3 subfamilies of the Corticiaceae of the Aphyllophorales. There were 2 common or frequent species, *Athelia epiphylla* and *Hyphoderma setigerum*, which must be dominant species on hardwoods and apparently play an important role in the ecology of the forests of Ullung Island.

Compared with the fungal flora of the mainland, corticioid fungi of Ullung Island seem to occur within the limits of host trees. Distribution of conifers in the island was generally poor and fungi associated with them were scarcely found throughout the island. On the other hand, fungi growing on hardwoods were repeatedly found on fallen branches, dead leaves, or dead trees in hardwood forests, For corticioid fungi, *Sambucus* and *Alnus* were the best host trees from which one third of fungi studied were collected.

The land of the island is unusually steep everywhere and is drained well during the rainy season. And most fungi were found in moist forests in the valleys or along the trails where enough moisture and shade are kept well all the time. Certain fungi adapted to these habitats, two corticioid species mentioned above in this study, were growing dominantly.

摘 要

1989년 10월 12일부터 일주일간 실시한 답사과정에서 발견한 107점의 표본과 1990년 8월 6일부터 닷새간 실시한 답사과정에서 발견한 68점의 균류표본을 포함하여 도합 175점의 표본이 울릉도에서 채집되었다. 이들 중에서 62점이 주로 평탄한 자실층 주조를 갖는 배착성 균류들이었으며, 그중 일부 고약버섯류가 최종적으로 동정되어 11종으로 확인되었다. 그 중 10종은 국내 미기록종으로서 우리나라의 균류분포목록에 새로이 추가되었다.

이들 균류들은 모두 고약버섯과에 속하는 종류들로서 이들의 이름을 나열하면 *Athelia epiphylla*(부후고약버섯, 新稱), *Grandinia alutaria*(둥근돌기고약버섯, 新稱), *G. breviseta*(흰돌기고약버섯), *G. granulosa*(돌기고약버섯, 新稱), *G. stenospora*(털돌기고약버섯, 新稱), *Cylindrobasidium evolvens* (담자고약버섯, 新稱), *Hyphoderma radula* (줄목재고약버섯, 新稱), *H. setigerum*(목재고약버섯, 新稱), *Hypochnicium eichleri*(흰후막고약버섯, 新稱), *Trechispora albo-ochracea*(황미세고약버섯, 新稱), 및 *T. farinacea* (분미세고약버섯, 新稱)이다.

울릉도의 고약버섯류는 육지에 비교하여 제한된 종류의 균류상을 보이고 있으며, 침엽수의 제한된 분포로 침엽수에 서식하는 종류가 매우 적었으며, 반면에 활엽수의 죽은 나무, 나무가지, 낙엽 등지에서 다양한 종류의 고약버섯들이 다수 발견된 점이 특이하였다. 울릉도의 지형은 지면의 경사가 심하고 배수가 빠르며, 산림의 조성이 다양하며

계곡과 등산로를 따라 그늘과 습기가 유지된 낙엽과 부식토양에서 딱총나무屬(*Sambucus*)과 오리나무屬(*Alnus*)의 나무를 중심으로 다수의 균류들이 채집되었으며, 섬의 환경에 잘 적응된 부후고약버섯(*Athelia epiphylla*)과 목재고약버섯(*Hyphoderma setigerum*)이 우점종으로 자라고 있었다.

ACKNOWLEDGEMENT

The present studies were supported by the Basic Science Research Institute Program, Ministry of Education, 1989, Project No. ED 89-43.

REFERENCES

Breitenbach, J. and F. Kränzlin. 1986. Fungi of Switzerland, Vol. 2. Non-gilled fungi: Heterobasidiomycetes, Aphyllophorales, Gasteromycetes. Verlag Mykologia, Lucerne. 412 pp.

Eriksson, J. and L. Ryvarden. 1973. The Corticiaceae of North Europe, Vol. 2. *Aleurodiscus-Confertobasidium*. Fungiflora, Oslo. pp. 58-286.

Eriksson, J. and L. Ryvarden. 1975. The Corticiaceae of North Europe, Vol. 3. *Coronicium-Hyphoderma*. Fungiflora, Oslo. pp. 288-546.

Eriksson, J. and L. Ryvarden. 1976. The Corticiaceae of North Europe, Vol. 4. *Hyphodermella-Mycoacia*. Fungiflora, Oslo. pp. 549-886.

Hjortstam, K., K.-H. Larsson, and L. Ryvarden. 1988. The Corticiaceae of North Europe, Vol. 8. *Thanatephorus-Ypsilonidium*. Fungiflora, Oslo. pp. 1447-1631.

Hong, S.W. and K.Y. Jang. 1981. Collection lists of fleshy fungi from Ulreung Island. *Rep. KACN* **19**: 183-189.

Jülich, W. and J.A. Stalpers. 1980. The resupinate non-poroid Aphyllophorales of the temperate northern hemisphere. North-Holland Publ. Co., Amsterdam. 335 pp.

Jung, H. S. 1987. Wood-rotting Aphyllophorales of the southern Appalachian spruce-fir forest. Bibl. Mycol. 119, J. Cramer. 260 pp.

Jung, H.S. and K.S. Shin. 1989. Soil microbial populations and higher fungi of Anma Archipelago. *Rep. KCCNP* **9**: 69-90.

Largent, D.L., D. Johnson, and R. Watling. 1977. How to identify mushrooms to genus, III. Microscopic features. Mad River Press Inc., Fureka. 148 pp.

Lee, Y.W. 1959. Higher fungi of Dagelet Island. *Korean J. Bot.* **2**: 22-24.

Liberta, A.E. 1973. The genus *Trechispora* (Basidiomycetes, Corticiaceae). *Can. J. Bot.* **51**: 165-207.

Parmasto, E. 1968. Conspectus systematis corticiacearum. Inst. Zool. Bot. Acad. Sci. R.P.S.S. Estonicae, Tartu. 262 pp.

(Received February 2, 1991)

Explanation of Plates

Plate 1. Hymenial surfaces
1. *Athelia epiphylla,* ×60
2. *Grandinia alutaria,* ×60
3. *Grandinia breviseta,* ×60
4. *Grandinia granulosa,* ×30
5. *Grandinia granulosa,* ×60
6. *Grandinia stenospora,* ×60

Plate 2. Hymenial surfaces
1. *Cylindrobasidium evolvens,* ×60
2. *Hyphoderma radula,* ×30
3. *Hyphoderma setigerum,* ×60
4. *Hypochnicium eichleri,* ×60
5. *Trechispora albo-ochracea,* ×60
6. *Trechispora farinacea,* ×60

Plate 3. Microscopic structures (bars=10 μm)
A. *Athelia epiphylla*: 1) basidiospores, 2) basidia, 3) subhymenial hyphae, 4) basal hyphae
B. *Grandinia alutaria*: 1) basidiospores, 2) basidia, 3) leptocystidia, 4) lagenocystidia, 5) hyphae
C. *Grandinia granulosa*: 1) basidiospores, 2) basidia, 3) leptocystidia, 4) hyphae
D. *Grandinia stenospora*: 1) basidiospores, 2) basidia, 3) leptocystidia, 4) conidia, 5) conidiophores, 6) hyphae
E. *Cylindrobasidium evolvens*: 1) basidiospores, 2) basidia, 3) cystidia, 4) vertical hyphae, 5) parallel hyphae

Plate 4. Microscopic structures (bars=10 μm)
A. *Hyphoderma radula*: 1) basidiospores, 2) basidia, 3) cystidia, 4) hyphae
B. *Hyphoderma setigerum*: 1) basidiospores, 2) basidia, 3) cystidia, 4) hyphae
C. *Hypochnicium eichleri*: 1) basidiospores, 2) basidia, 3) cystidia, 4) hyphae
D. *Trechispora albo-ochracea*: 1) basidiospores, 2) basidia, 3) crystals, 4) hyphae
E. *Trechispora farinacea*:1) basidiospores, 2) basidia, 3) pleurobasidia, 4) hyphae
F. *Grandinia breviseta*: 1) basidiospores, 2) basidia, 3) capitate leptocystidia, 4) torulose leptocystidia, 5) hyphae

PLATE 1

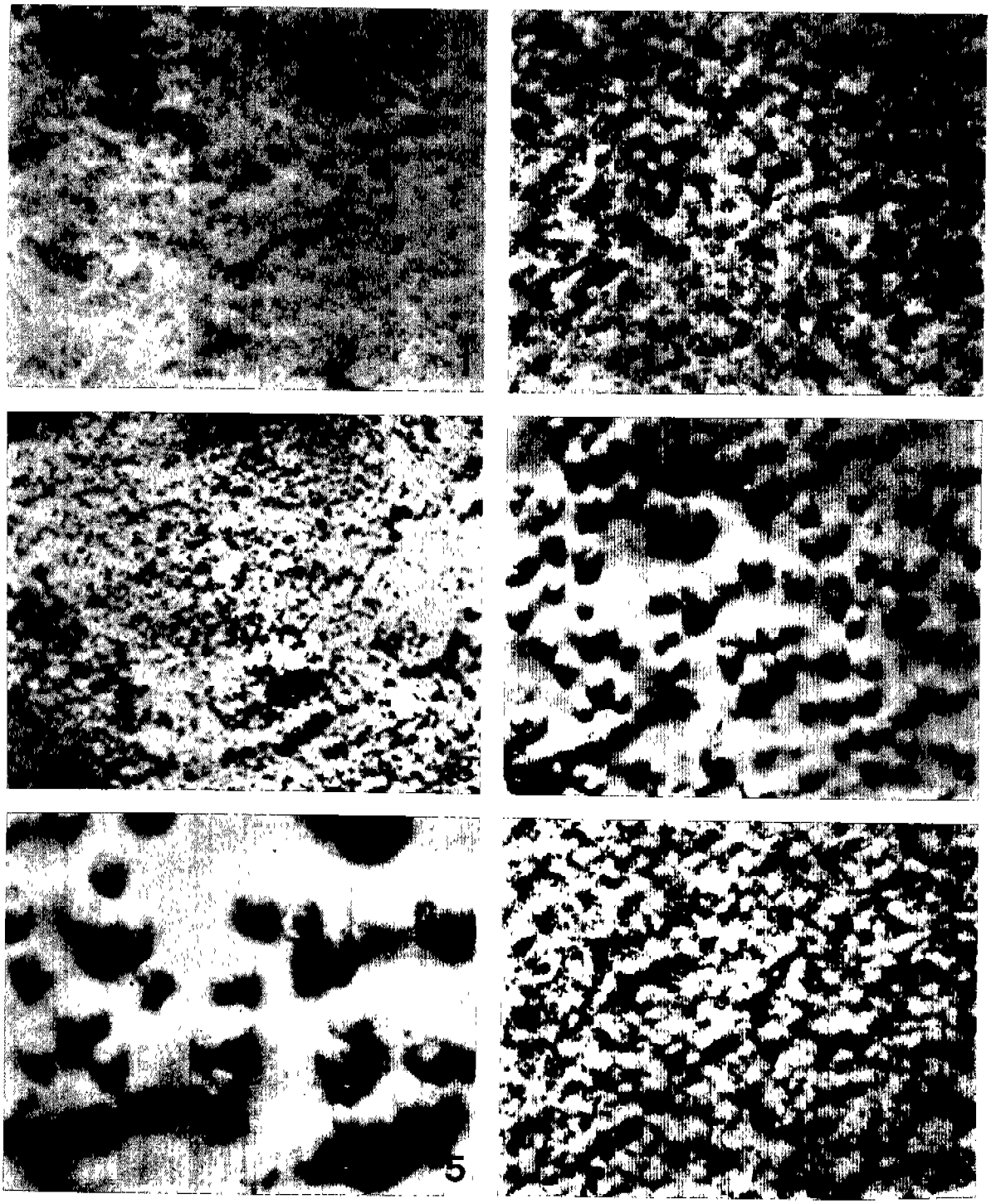
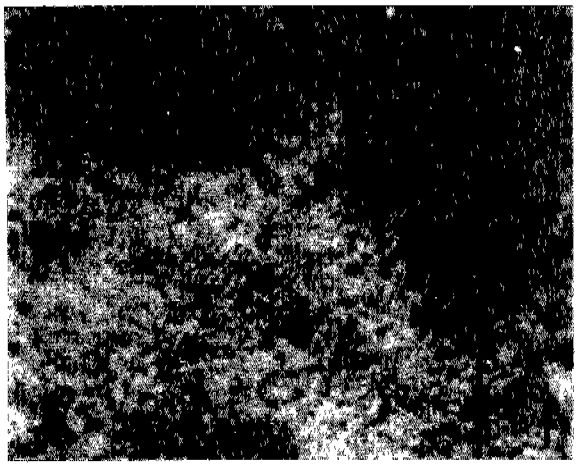
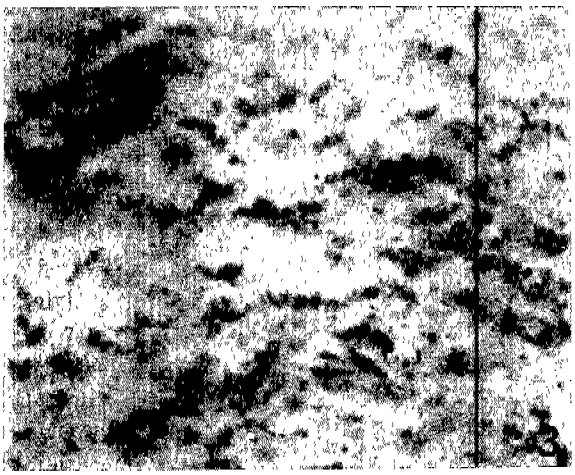
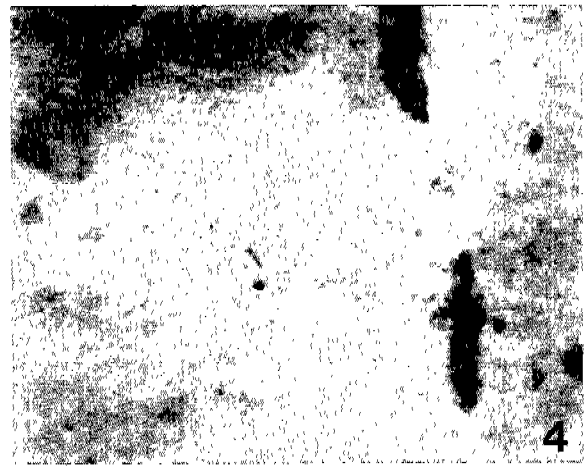
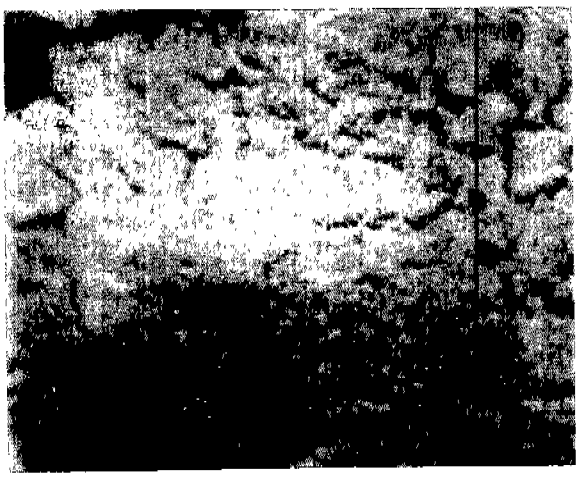


PLATE 2









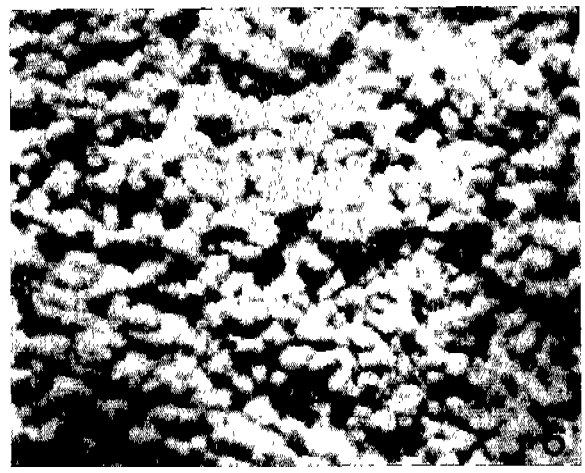


PLATE 3

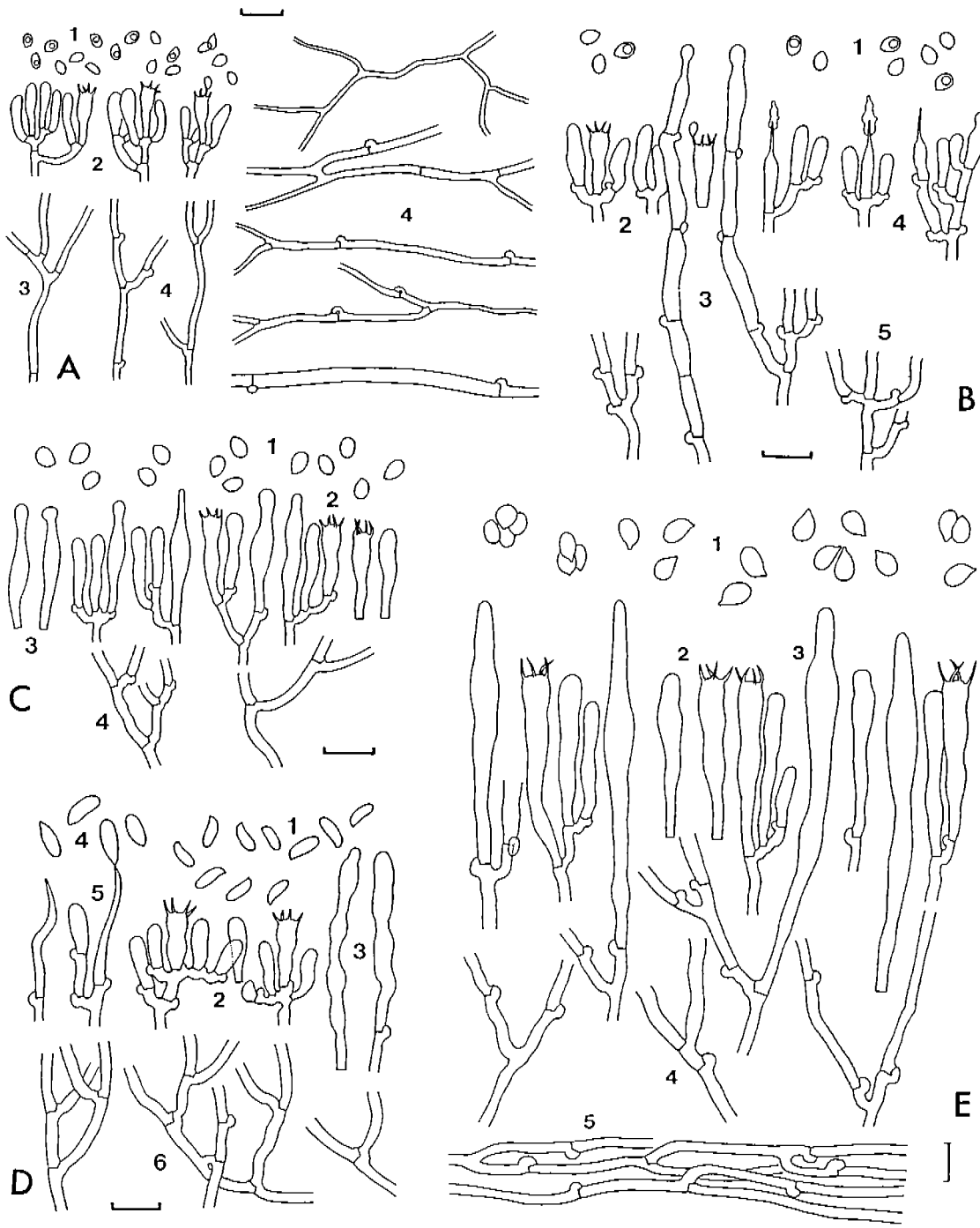


PLATE 4