

Some Unrecorded Higher Fungi of the Seoraksan and Odaesan National Parks

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Higher Fungi were collected twice a month from May to September 2004 during field survey trips to Seoraksan and Odaesan National Parks. All the collected specimens were investigated for the morphological characters of carpophores and other features, and deposited in the herbarium of the Entomopathogenic Fungal Culture Collection (EFCC), Kangwon National University, Chuncheon. Among the identified specimens, three genera *Rhodotus*, *Hotermannia* and *Sebacina* and four species *Rhodotus palmatus*, *Gomphus clavatus*, *Holtermannia corniformis* and *Sebacina incrustans* were confirmed as new to Korea and reported here with descriptions.

KEYWORDS: Seoraksan and Odaesan National Parks, Unrecorded taxa

The Seoraksan and Odaesan National Parks are located at Gangwon-do. As these two national parks lie on the boundary between Youngseo and Youngdong areas, they are affected by both continental and oceanic climates. Average temperature and precipitation per year in Seoraksan are 13.2°C and 1,342 mm, respectively. Average temperature and precipitation per year in Odaesan are 14.1°C and 1,402 mm, respectively.

The Seoraksan and Odaesan National Parks have good quality forests and suitable environments for fungal growth. Despite floral diversity in these parks, research on fungal flora has not been studied to date. Therefore, in order to get informations on fungal flora, investigation on national park natural resources has been promoted by the National Park Authority. Regular field trips were made to these park areas and fresh fungal specimens were collected from selected areas of the national parks for 24 days from May to October in 2004. A total of 8628 fungal specimens were collected and all specimens were taxonomically identified up to species level through observation of morphological and microscopic characters. Among them, four species and three genera were identified as unrecorded taxa in Korea.

Materials and Methods

To observe the macroscopic and microscopic features of basidiomes, measurements of the fruitbodies, characters of the pileus, lamellae, stipe and etc. were investigated based on the method described by Largent *et al.* (1977). Microscopic characters were sketched using a drawing tube and more than 30 measurements were taken for description of average dimensions of each character. The color terms

described previously by Komerup and Wanscher (1978) and Munsell notation were used. All specimens examined are preserved in the herbarium of EFCC (Entomopathogenic Fungal Culture Collection).

Taxonomy

Various identification key systems were used for general taxonomy and descriptions of identified taxa. The system of Dennis (1981) was followed for the ascomycetous fungi, the classification of McNabb (1973) was employed for the auriculariaceous and dacrymycete fungi, the key of Dring (1973) was used for the gasteromycetous fungi, the system of Singer (1986) was applied for the Agaricales, and Donkian concept (Donk, 1964) was adopted for the Aphyllophorales. Illustrations of Breitenbach and Kränzlin (1984~2000), Imazeki and Hongo (1987~1988) were referred for taxonomic characterization of general fungi.

To follow modern systematics, latest scientific names were considered as much as possible. Recent classification keys were referred for identification of Korean higher fungi. However, few morphological characters of Korean higher fungi were found to be different from those of other countries. Therefore, these typical morphological characters were taken into consideration in identification of the species.

In this investigation, a total of 8628 fungal specimens were collected and all specimens were identified up to species level. They were classified into 6 classes, 14 orders, 46 families 115 genera and 221 species. Among them, three genera *Rhodotus*, *Hotermannia* and *Sebacina*, were identified as unrecorded taxa and four species *Rhodotus palmatus*, *Gomphus clavatus*, *Holtermannia corniformis* and *Sebacina incrustans*, were confirmed as new to Korea and reported here with their descriptions.

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Rhodotus Maire, Bull. Soc. mycol. Fr. 40:308 (1926)
살구버섯속(신칭)

Type species : *Rhodotus palmatus* (Bull. ex Fr.) Maire

Rhodotus palmatus is the only species and can be recognized by its convex to broadly convex pileus which is somewhat gelatinous in consistency and is rivulose-reticulate, by creamy pink spores and lignicolous habit.

1. *Rhodotus palmatus* (Bull. ex Fr.) Maire Bull. Soc. mycol. Fr. 40:308 (1926) 살구버섯(신칭) (Figs. 1, 5)

Macroscopic features

Pileus 25~52 mm broad, hemispherical to convex when young, broadly convex to plane when old, sometimes with a broad umbo in the center. Pileus surface, gelatinous, pale red to pinkish white (7-8A2-3), wrinkly or bumpy towards center, striate up to 1/5 of the distance to the center. Pileus thickness 5~9 mm. Surface gelatinous layer 0.5~0.8 mm. Context pale red to pinkish white (7-8A2-3), somewhat fleshy-fibrous. Odor and taste mild. Lamellae emarginate, close, width 4~5 mm thickness 0.5~1 mm. Lamellae edge fimbriate. Stipe 20~35 × 6~8 mm, cylindrical, somewhat equal, straight, flexuous, or leathery, surface dry, finely hispid, longitudinal striate, reddish grey (7-8B2). Stipe attachment central to excentric. Innerveil and universal veil absent.

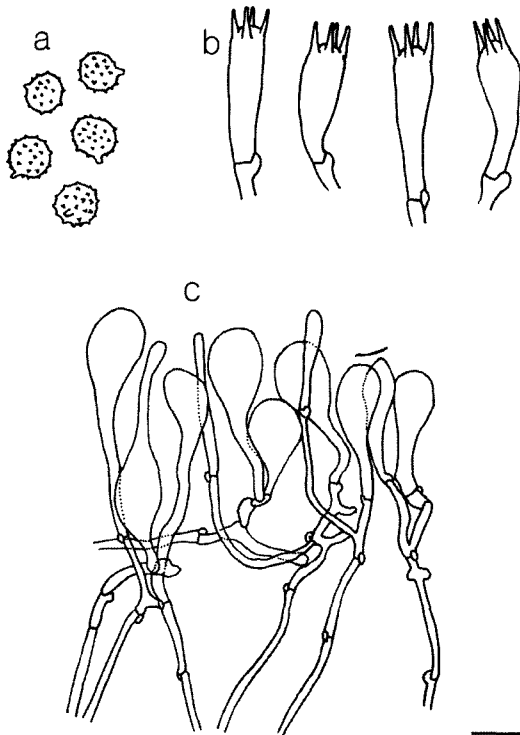


Fig. 1. Microscopic and macroscopic structures of *Rhodotus palmatus*. a. Basidiospores (× 1000), b. basidia (× 1000), c. Pileipellis (× 400), scale bar = 9.1 μm (× 1000), 22.5 μm (× 400).

Microscopic features

Basidiospores 6.3~4.3 × 6.2~7.7 μm, globose to subglobose, aculeate, hyaline, imamyloid; spore print pinkish white. Basidia (28.4)30.6~36.8 × 57~6.6(7.0) μm, with 4-spored and basal clamp. Hymenophoral trama loosely interwoven. Pleurocystidia and cheilocystidia absent. Pileipellis consisting of hymeniform layer.

Habit & Habitat : Solitary to gregarious or imbricate on hardwoods.

Distribution : Korea, Japan, North America, Europe.

Materials examined : EFCC04-02001, Mt. Odae, Gangwon-Do, 2 Jul. 2004, EFCC04-04001, Mt. Odae, Gangwon-Do, Aug. 2005.

Remarks : This species resembles to *Pleurotus salmoneostramineus* in shape and color at young stage. However, the lamellar attachment of *R. palmatus* is not decurrent like *P. salmoneostramineus* but emarginate. On maturity, pileus of *R. palmatus* turns hemispherical to convex while that of *P. salmoneostramineus* remains plane. The carpophores of this species form several compartments on the pilus surface in dry condition.

2. *Gomphus clavatus* (Pers. :Fr.) Gray Nat. Arr. Brit. Pl. (London) 1:638 (1821) 자주나팔버섯(신칭) (Figs. 2, 6)

Macroscopic features

Carpophore 40~145 × 15~70 mm, when young cylindrical-

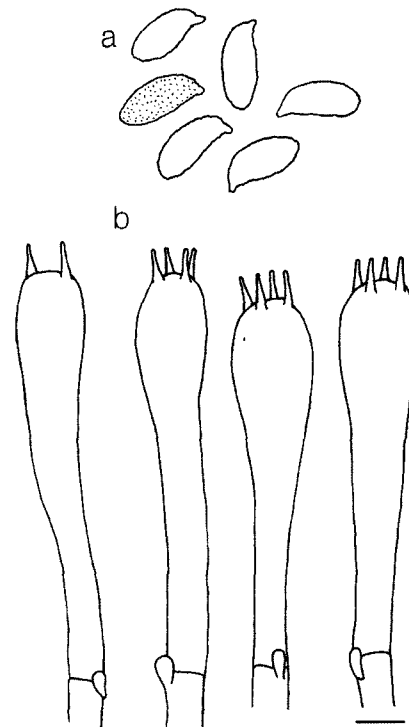


Fig. 2. Microscopic and macroscopic structures of *Gomphus clavatus*. a. basidiospores (× 1000), b. basidia (× 1000), scale bar = 9.1 μm (× 1000).

conic, clavate, truncate and flat above, grayish violet to dark violet (17E-F4-5), when old depressed above, infundibuliform, or sometimes somewhat elongated and ear-shaped on a side, ocher- to gray-brown with a violet tint. Outer surface with the hymenophore longitudinally venose, smooth to undulating-wrinkled, margin sharp. Broad and thick ridges which are forked and united by anastomoses. Context white to pale lilac, soft and fragile. Odor and taste mild.

Microscopic features

Basidiospores $12.5\text{--}14.5 \times 5.3\text{--}6.0 \mu\text{m}$, ellipsoid, verrucose, spore print grayish yellow to ocher. Basidia $60.8\text{--}71.0 \times 10.7\text{--}12.8 \mu\text{m}$, cylindro-clavate, 2.4-spored with basal clamp. Cystidia absent.

Habit & Habitat : Solitary to gregarious or imbricate on the ground in conifer forest.

Distribution : Korea, Japan, North America, Europe, and worldwide.

Materials examined : EFCC04-04002, Mt. Odae, Gangwon-Do, 20 Aug. 2004

Remarks : The violet color of this species is much stronger than that of *Gomphus floccosus* and *G. fujisanensis*. The carpophore of this species has club shapes like *Clavariadelphus* species at young stage, but turns funnel or trumpet shape at mature stage.

Holtermannia Sacc. & Traverso, in Saccardo, Syll. fung. (Abellini) 19:871 (1910) 산호버섯속 (신칭)

Type species : *Holtermannia pinguis* (Holterm.) Sacc. &

Traverso

3. *Holtermannia corniformis* Kobayasi Sci. Rep. Tokyo Bunrika Daig., Sect. B 3:78 (1937) 팔산호버섯 (신칭) (Figs. 3, 7)

Macroscopic features

Carpophore $10\text{--}15 \times 2\text{--}3 \text{ mm}$, fruiting body consisting of cylindrical to subulate spines with blunt to pointed, simple, forked, ends, negatively geotropic, surface smooth, lubricous, white, cream to light brown (7D4), darker toward the base. Context soft, fragile, somewhat gelatinous, translucent. Odor and taste mild.

Microscopic features

Basidiospores $9.0\text{--}10.3 \times (5.8)6.8\text{--}8.1 \mu\text{m}$, globose to subglobose, hyaline. Hypobasidia spherical to oval, $14.0\text{--}48.0(61.0) \times 13.9\text{--}17.0 \mu\text{m}$, longitudinally septate, with epibasidia, sometimes very long. Cystidia absent. Hyphae hyaline, $2.0\text{--}3.0 \mu\text{m}$ across, septa with clamps.

Habitat : gregarious or imbricate on hardwoods.

Distribution : Korea, Japan, North America, and Europe.

Materials examined : EFCC04-04003, Mt. Odae, Gangwon-Do, 20 Aug. 2004, EFCC04-03030, Mt. Seorak, Gangwon-Do, 21 Jul. 2004.

Remarks : The flesh of this species is fragile as *Clavaria* or *Ramaria* species. The shape of *H. corniformis* resembles to that of *Calocera cornea*. However, this species is translucent to white in color and agglutinate in basal attachment differing from *C. cornea*.

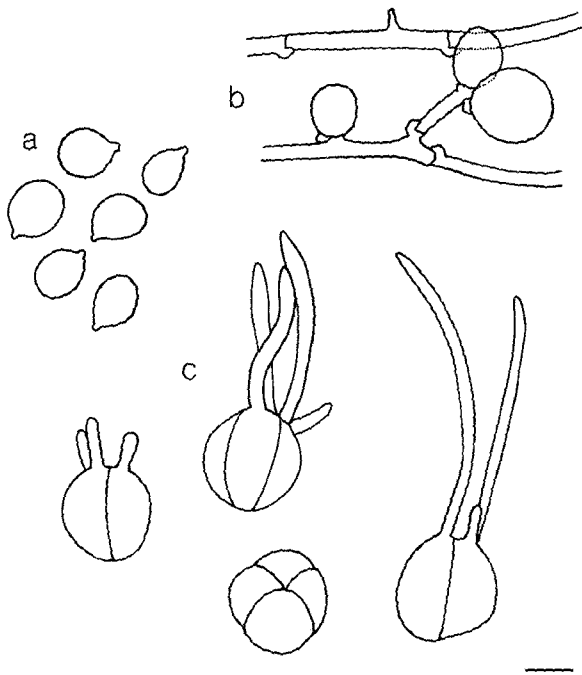


Fig. 3. Microscopic and macroscopic structures of *Holtermannia corniformis*. a. basidiospores ($\times 1000$), b. hyphae ($\times 1000$), c. basidia ($\times 1000$), scale bar = $9.1 \mu\text{m}$ ($\times 1000$).

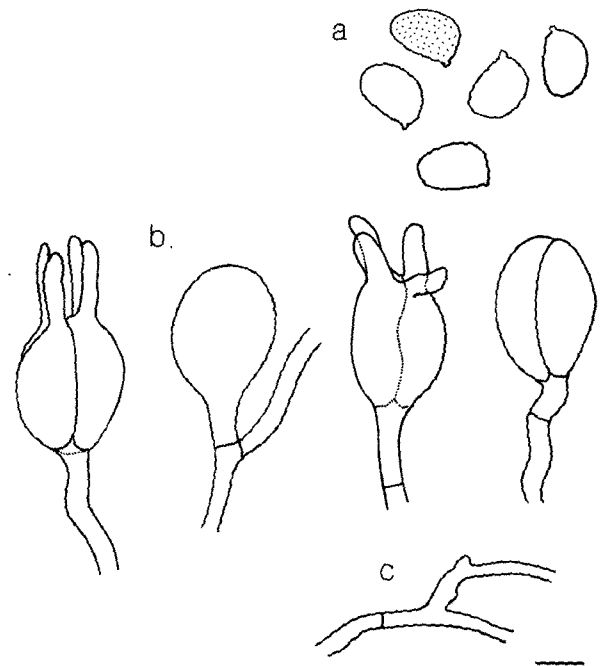


Fig. 4. Microscopic and macroscopic structures of *Sebacina incrustans*. a. Basidiospores ($\times 1000$), b. basidia ($\times 1000$), c. hyphae ($\times 1000$), scale bar = $9.1 \mu\text{m}$ ($\times 1000$).

Sebacina Tul. & C. Tul., J. Linn. Soc., Bot. 13:36 (1871)

큰약버섯속 (신칭)

Type species : *Sebacina incrustans* (Pers.) Tul. & C. Tul.

Sebacina species cover plant debris and soil. Consistency of their texture is waxlike or gelatinous.

4. *Sebacina incrustans* (Pers.) Tul. & C. Tul. Annl. Sci. Nat., Bot., sér. 5 15:225 (1871) 납작큰약버섯 (신칭) (Figs. 4, 8)

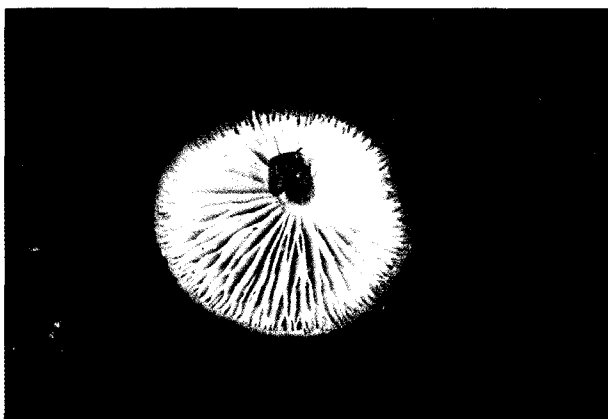
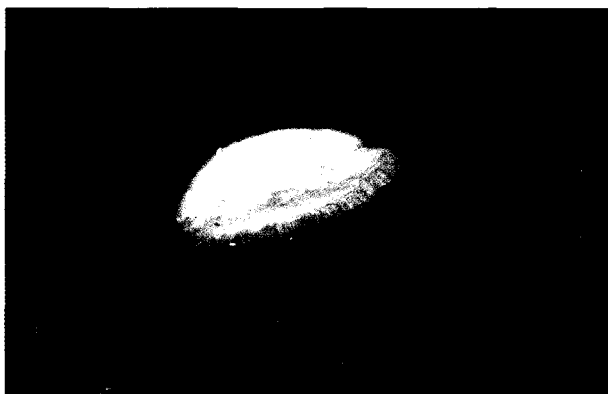


Fig. 5. Carpophore of *Rhodotus palmatus*.



Fig. 6. Carpophores of *Gomphus clavatus*.

Macroscopic features

Carpophore fully resupinate, attached tightly to the substrate, forming patches up to 1~2 mm thick, several centimeters in extent. Surface smooth to undulating-tuberculate. Surface and context color semitransparency to cream to white humidly, turning white dry. Consistency gelatinoid.

Microscopic features

Basidiospore 10.8~11.7 × 7.0~7.6 μm, elliptical, finely verrucos, hyaline. Hypobasidia pyriform to oblong, 22.3~34.0 × 14.4~17.0 μm, longitudinally septate, with 4 epibasidia. Hyphal system monomitic, hyaline, 2.2~3.0 μm across, septa without clamps.

Habit & Habitat : agglutinated on annual plants

Distribution : Korea, Japan, Asia, North America, and Europe.

Materials examined : EFCC04-02010, Mt. Sorak, Gangwon-Do, 20 Jun. 2004 EFCC04-03013, Mt. Odae, Gangwon-Do, 2 Jul. 2004 EFCC04-04015, Mt. Odae, Gangwon-Do, 20 Aug. 2004

Remarks : In field, the flesh of *Sebacina incrustans* is gelatine (or wax) like resupinate fungi including family Corticiaceae. But this species differs from other resupinate fungi as it does not form pore on the surface of carpophore on mature, and form longitudinally basidial septa



Fig. 7. Carpophores of *Holtermannia corniformis*.



Fig. 8. Carpophores of *Sebacina incrustans*.

which can be observed under microscope.

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