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Taxonomic Studies of the Genus *Odontia* and its Allied Genera in Japan

By

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Contents

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I Introduction

The genus *Odontia* is a group of fungi which belong to Hydnaceae, a family of the Basidiomycetes. The fruit bodies of the genus *Odontia* are resupinate and membranaceous to crustaceous. On the hymenial surface they have conical to cylindrical spines, teeth or warts, being visible with the naked eye. The most important microscopical character of the genus is the presence of cystidia in the hymenium. They usually grow on the bark of branches and stems of dead trees, though some species are found on living trees causing white rot of woods. They are widely distributed throughout the world.

The species of this genus have a considerably strong ability to decay wood. In the forest, they decompose fallen leaves and branches, promoting the reduction to organic matter. Thus they play a part in the circulation of substances in the natural world. On the other hand, they occasionally become causal agents of heart rot of living trees and cause serious damage to forest trees (Davidson, 1957). In U. S. A. and Japan, it was reported that they caused considerable damage to wooden structures (Silverborg, 1953, Aoshima & Furukawa, 1966b).

Since the genus was established by Fries (1836～1838, 1874) many investigations have been published concerning the original genus and its allies up to the present time. That is, Bourdot & Galzin (1927) reported on the species of this genus in France, Miller (1934b) on the species collected in U. S. A., Christiansen (1952～1953) on the species of Denmark, Eriksson (1958) on the species of Sweden, Cunningham (1959) on the species of New Zealand and Nikolajeva (1961) on the species of U. S. S. R., respectively. Gilbertson (1962, 1963, 1964 and 1965) restudied the type species of resupinate hydnaceous fungi of North America and made clear synonymous relations.

In Japan, only three species had been reported by Yasuda (1920), Imazeki & Toki (1954) and S. Ito (1955), and recently seven species were added by Aoshima & Furukawa (1966b) and Furukawa & Aoshima (1966). The writer has collected about three hundred specimens over the entire area of Japan. After careful examination on these specimens, the writer found 12 new species and 10 species which have not hitherto been recorded for the Japanese fungus flora.

Among the resupinate hydnaceous fungi, members of the genera *Odontia, Mycoacia, Dentipellis, Basidioradulum, Grandinia* and *Sarcodontia* have no color in the hyphae and basidiospores. The genera *Mycoacia, Dentipellis* and *Basidioradulum* are very similar to the genus *Odontia* in the shape of basidiocarps and hyphal structures. The latter two genera, *Grandinia* and *Sarcodontia*, have not been reported in Japan.

The genera *Laeticorticium* and *Mucronella* have different hyphal characters in the basidiocarps as compared with the genus *Odontia*, and are to be classified different families from the genus *Odontia*; the former belonging to Corticiaceae and the latter to Clavariaceae. Both of these genera, however, are very similar to the genus *Odontia* in respect of external morphologic characters, and it is difficult to distinguish them with the naked eye.

The writer examined a number of specimens belonging to the genus *Odontia* and the allied genera, and intends to make clear the relationship among these genera based mainly on their microscopical characters.

In this report, the descriptions of species and genera with their keys are presented. Their ecological and cultural characters are also examined and described.

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II Materials and Methods

1. Materials

The fungus materials or specimens used in the present study amounted to more than three hundred. They were mainly collected by the members of the laboratory of Forest Mycology, Government Forest Experiment Station for these more than twenty years, from the subarctic forested regions of Hokkaido south to the subtropical areas of Japan. They are all kept in the herbarium of Forest Mycology, Government Forest Experiment Station, Meguro, Tokyo. In addition to the Japanese collections, some specimens collected in foreign countries have been examined, preserved in the herbarium of the National Science Museum, Ueno Park, Tokyo. The cultures used for this study were obtained from fresh basidiospores using isolation technique made by Davidson *et al.* (1942).

2. Methods

Thin pieces were made by hand section method from each part of dried basidiocarp specimens and observations were made under the microscope after mounting them in 5% KOH solution.

When there was a need of dyeing hyphae, phloxin, cotton blue or acetic acid carmin were used. Meltzer's solution*1 was used for judging amyloidity of spores, hyphae and gloeocystidia, and sulfuric benzaldehyde*2 for identifying gloeocystidia, as chemical reactive reagents.

For description of cultural characters*3, the writer referred to Davidson *et al.* (1942) and Nobles (1948). ♂ mark affixed after specimen number indicates the specimen from which the culture has been obtained.

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*1 Meltzer's solution : Iodine……0.5 gr, Potassium iodide……1.5 gr, Chloral hydrate……20 gr, Water……20 cc.

*2 Sulfuric benzaldehyde : Pure sulfuric acid……5 cc, Benzaldehyde……4.5 cc, Water……1.5 cc.

*3 Culture medium used is as follows : Potato glucose agar medium : Potato decoction (200 gr of potato) ……1,000 cc, Glucose……20 gr, Agar……20 gr, Malt agar medium : Malt decoction (100 gr of Malt) ……1,000 cc, Agar……20 gr.

3. **General references and abbreviations**

For the scientic name of host trees, the writer referred to HONDA's "Nomina Plantarum Japonicarum" (1957), and for description of colors, the "Ringyo siken kiso chosa yoo hyojun shikimei" (1943) compiled by the Tokyo Regional Forestry Office was used.

The following abbreviation are used :

1) Herbarium name :

F : Herbarium of Forest Mycology, Government Forest Experiment Station, Meguro, Tokyo.

TNS : National Science Museum, Ueno Park, Tokyo.

2) Collector's name :

K. A. : Kiyowo AOSHIMA

Y. H. : Yasuo HAYASHI

T. K. : Tadashi KOBAYASHI

H. F. : Hisahiko FURUKAWA

III Historical review on the concept of the genus *Odontia* and its allied genera

1. *Odontia* FRIES

The genus *Odontia* was established by FRIES in 1836 (as well as in 1838) based on *Odontia fimbriata* (PERS.) FR. as the type species and five species were described. Later in 1874, he described three new additional species in this genus. BOURDOT & GALZIN (1927) studied *Odontia* in France and recorded 26 species. Although his concept of the genus *Odontia* was comparatively broad, the basis for classification of resupinate Hydnaceae in the European countries was established. MILLER (1934b) studied the genus *Odontia* in Iowa State, U. S. A., and recorded 20 species including one new species and two new combinations. BROWN (1935) described 12 species in North America in detail. Of those species of North America, GILBERTSON (1962, 1963, 1964 and 1965) made critical studies on the type specimens described by PECK (1897, 1900), BRESADOLA (1925), OVERHOLTS (1930), LLOYD (1915, 1916, 1919, 1920 and 1922), BURT (1917), COOKE & ELLIS (1881, 1885), MILLER (1934b) and BERKELEY & CURTIS (1849, 1873a). A series of studies made by GILBERTSON gave highly significant ideas in correcting misapplied taxonomic data traditionally accepted by many authorities.

CHRISTIANSEN (1952～1953) recorded species of Denmark, ERIKSSON (1958) described those of Sweden, CUNNINGHAM (1959) of New Zealand and NIKOLAJEVA (1961) of U. S. S. R., respectively. Among them, the system of classification of Hydnaceous fungi proposed by ERIKSSON is extremely particular, and as discussed in chapter IV in this paper, the system was not accepted by the present writer.

In Japan, YASUDA (1920) recorded one species. However, the studies on the genus *Odontia* did not show any progress for years, until IMAZEKI & TOKI (1954) and S. ITO (1955) described one species, respectively. Recently, in 1966, AOSHIMA & FURUKAWA (1966b) and FURUKAWA & AOSHIMA (1966) recorded seven species additionally.

2. *Mycoacia* DONK

The genus *Micoacia* was established by DONK in 1931 based on *Hydnum fusco-atrum* FR. ex FR. as the type species. The genus *Oxydontia* proposed by MILLER (1933b) is very similar to

Mycoacia in its concept. *Sarcodontia* established by SCHULZER (1866) also has a similar concept to these two genera. Concerning the relationship among these three genera, RAGAB (1951) and DONK (1952) published their opinions. AOSHIMA & FURUKAWA (1966a) examined the original specimen of *Hydnum earleanum* SUMST. (=*S. mali* S. SCHULZ.) which is the type species of the genus *Sarcodontia* and compared it with the type species of both genera of *Mycoacia* and *Oxydontia*. As a result, they accepted the genera *Sarcodontia* and *Mycoacia*, and placed *Oxydontia* in a synonym of *Mycoacia*. They described three species of *Mycoacia* for Japan.

3. ***Dentipellis*** **DONK**

This is a genus established by DONK in 1962 based on *Hydnum fragile* PERS. ex FR. as the type species. There is no record other than the original description. The smooth and amyloid spores are the main character of the genus as described by DONK. However, the writer found a species with spiny and amyloid spores. Thus, the original concept of the genus *Dentipellis* was extended.

4. ***Basidioradulum*** **NOBLES**

This is a genus recently established by NOBLES in 1967 based on *Hydnum radula* (FR.) FR. as the type species.

The concept of this genus is completely the same with that of the genus *Radulum* traditionally used. Examing the type specimen of *Radulum aterrinum* FR., DONK (1956b) found that the type species of the genus *Radulum* was nothing but *Eutypa hydnoidea* (FR.) HÖHN. *Eutypa* is an Ascomycetous fungus. NOBLES accepted the DONK's opinion, and she established a new genus.

5. ***Laeticorticium*** **DONK**

Laeticorticium DONK (1956a) is a genus which belongs to Corticiaceae. Macroscopically it resembles the genus *Odontia*, but its hyphal system is entirely different. Five species were included by DONK in this genus, and GILBERTSON (1962) accepted this genus and included one additional species in this genus. One species was recorded in Japan by AOSHIMA & FURUKAWA (1966b).

6. ***Mucronella*** **FRIES**

This was established in 1874 as a genus of Hydnaceae, based on *Hydnum calvum* FR. as the type species. However, in 1950 this was regrouped into Clavariaceae by CORNER from the histological viewpoint of mycelial cells composing the sporophore tissues. NIKOLAJEVA (1961) placed again this genus in Hydnaceae.

IV Taxonomical considerations on the genus *Odontia* and its allied genera

1. Gross morphological characteristics and a key to the genera

Basidiocarps are annual, resupinate, widely effused on the substratum, separable from the substratum especially in species of genera *Dentipellis* and *Laeticorticium*, but not separable in species of other genera. They are membranous, floccose, crustaceous or ceraceous, sometimes pruinose and white, cream or pinkish brown, sometimes red in color, with hymenophores of

spines, teeth or warts.

Subiculum is composed of one layer tissue, and hyphae are naked or incrusted with calcium oxalate, mostly with clamp connection, usually hyaline, rarely colored, cream or pallid pink under the microscope in 5% KOH, freely branched and septate. Hyphal system of the genera *Odontia*, *Mycoacia* and *Basidioradulum* is monomitic, and of the genera *Dentipellis* and *Laeticorticium* is dimitic. Subiculum is absent in the genus *Mucronella*.

The spine of the genus *Odontia* is small, mostly up to 5 mm long, conical or cylindrical with apex usually penicillate with tufts of projecting incrusted hyphae.

The axis of the spine is composed of parallel hyphae from which arise the palisade-like hyphal layer which often associated with various ancillary organs. In some species the spine axis is almost filled with incrusted or naked cystidia. The apices of the spines are usually tufted, either with fascicles of projecting incrusted hyphae or projecting apices of cystidia.

The spine of the genera *Mycoacia* and *Dentipellis* is long, usually 1～15 mm, slender, subulate or cylindrical, densely crowded, fragile. The axis is sterile and composed of parallel hyphae. However, spines of the genus *Basidioradulum* are small, mostly up to 5 mm long, usually warted or tooth-like. The axis is composed of paralleled hyphae and the apices are sterile.

Basidia are subclavate or clavate, with 2～4 sterigmata in all genera.

Cystidia are found in hymenium in all species of the genus *Odontia*, projecting from apices of the spines. They are cylindrical, lanceolate, clavate, capitulate, fusiform, acuminate, capitate or spatulate, thin-walled or thick-walled, hyaline under the microscope in 5% KOH, usually naked or sometimes incrusted. Antler-like hyphidia are found abundantly in the hymenial layer of the genus *Laeticorticium*. However, in genera *Mycoacia*, *Dentipellis*, *Basidioradulum* and *Mucronella* cystidia are lacking.

Gloeocystidia present in all species of the genus *Dentipellis*. They are imbedded in the hymenium or subiculum, and are dark greenish under the microscope in 5% KOH, often ending in a clavate or lanceolate tip. However, in other genera gloeocystidia are absent.

Basidiospores are elliptical, obovate, oval, subglobose, globose, suballantoid or allantoid. They are hyaline, smooth walled, and non-amyloid in most genera. However, a certain species of *Dentipellis* has echinulate spores and all species of this genus have amyloid spores.

Key to the genera

A 1 : Basidiocarps resupinate, with distinct spines, teeth or warts.
　B 1 : Hyphal system dimitic.
　　C 1 : Antler-like hyphidia present in hymenial layer, spore smooth, non-amyloid……*Laeticorticium* (Corticiaceae) (5)
　　C 2 : Gloeocystidia present, spore smooth or echinulate, amyloid……*Dentipellis* (3)
　B 2 : Hyphal system monomitic.
　　C 1 : Cystidia present ……*Odontia* (1)
　　C 2 : Cystidia absent.
　　　D 1 : Subiculum soft, tomentose, floccose……*Mycoacia* (2)
　　　D 2 : Subiculum waxy, ceraceous……*Basidioradulum* (4)
A 2 : Spines arising directly from the substratum……*Mucronella* (Clavariaceae) (6)

2. Taxonomical discussion of families and genera

Odontia Fr. and *Mycoacia* Donk have been classified in the familie Hydnaceae Chev. together with well known genera, such as *Hydnum* L. ex Fr. and *Steccherinum* S. F. Gray etc. Originally, Hydnaceae represents a group of fungi which have hymenophores with spine projections. The most important character of the familie Hydnaceae is its hymenophore made of spines and teeth, which has well developed to tramal tissue. As its type genus, *Hydnum* Linne ex Fr. (Type species : *H. repandum* Linne ex Fr.) was designated by Chevallier (Donk, 1964). At present, many genera and species placed under Hydnaceae comprise those of different qualities and systems compared with *H. repandum* which is the type species of the genus *Hydnum*, and this eloquently indicates that Hydnaceae is a family including many contradictions when viewed systematically. However, keeping pace with the progress of taxonomy (natural classification) the above contradiction is being corrected, though fragmentary. For example, the separation and establishment of such new families as Bankeraceae Donk (1961) (Type : *Bankera* Coker et Beers ex Pouz.), Auriscalpiaceae Mass G. (1963) (Type : *Auriscalpium* S. F. Gray) and Echinodontiaceae Donk (1961) (Type : *Echinodontium* Ell. & Ev.) etc. show such trend. The basis for proposing such new families is that the external appearance alone is meaningless in representing the real natural group and affinity. It is widely acnowledged that in modern taxonomy, more importance is laid on the microscopical characters, particularly, on characters of hyphae and hyphal systems composing the tissues and on chemical reaction to various regents. The natural classification has been practised by putting such characters and qualities rather than by macroscopical characters.

John Eriksson (1958) established the genus *Hyphodontia* in Corticiaceae designating *Peniophora pallidula* (Bres.) Bres. ex Bourdot et Galzin as type species. He transferred into this genus 11 species from *Odontia*, 1 species from *Radulum*, 2 species from *Corticium* and 6 species from *Peniophora*, and exempted the genera *Mycoacia*, *Odontia* and *Radulum* from Hydnaceae and placed them in Corticiaceae, recognizing the similarity in hyphal structures to the genera *Corticium* and *Peniophora* of Corticiaceae. His opinion was accepted by Christiansen (1960) and Donk (1964).

With such hymenophore structures, in contrast with the genera *Corticium*, *Peniophora* etc. in addition to these the apex of the spines and teeth is always sterile. This is the spine in its real sense (Fig. 1), and this has been confirmed with the spine and tooth of species of such genera as *Odontia*, *Mycoacia*, *Dentipellis* and *Basidioradulum* which were examined by the writer. As stated above, the species having the spine and tooth in their real sense should be classified under Hydnaceae. In such sense, the writer considers that *Odontia*, *Mycoacia*, *Dentipellis* and *Basidioradulum* are the genera which should be placed under Hydnaceae.

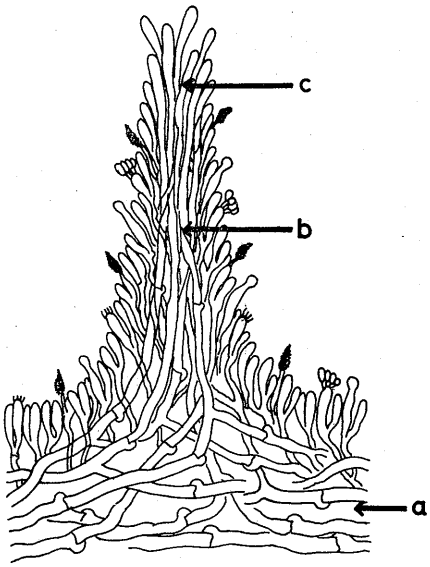

Fig. 1 Long section of spine (*Odontia arguta* (Fr.) Quél.)
a : Subiculum b : Trama
c : Apex of spine, sterile

3. Genera related to the genus *Odontia*

The two genera *Hyphodontia* and *Phlebia* are most related genera to the genus *Odontia*. They are as follows :

Hyphodontia Eriksson

Symb. Bot. Upsal., 16(1) : 101, 1958; Christiansen, Dansk Bot. Arkiv 19(2) : 216, 1960.

Basidiocarps resupinate, floccose, soft, membranaceous to waxy, white to ochraceous, hymenium even or somewhat warted to odontoid or hydnoid; Hyphae distinct, fibrous, with clamp connections; Cystidia present, hyphae like, thin to slightly thick-walled, septate and then often ampullate and with oil drop at the septa, sometimes capitate; Basidia small, clavate; Basidiospores small, ovate or narrowly cylindrical, non-amyloid.

Type species : *Gonatobotrys pallidula* Bres. (=*Peniophora pallidula* (Bres.) Bres.)

Family : Corticiaceae.

Note.

Eriksson placed in this genus the following twenty species. Those marked with asterisk (*) represent species directly examined by the writer.

Hyphodontia niver (Pers.) Eriksson (=*Corticium niveum* Bres., Ann. Myc., 1 : 98, 1903)

H. sambuci (Pers. ex Pers.) Eriksson (=*Thelephora sambuci* Pers. ex Pers., Myc. Eur., 1 : 152, 1822)

H. alienata (Lundell in Lundell & Nannf.) Eriksson (=*Peniophora alienata*, Lundell in Lundell & Nannf., Fung. exs. suec. n. 1043 fase. 21～22 : 28, 1941)

H. alutaria (Burt) Eriksson (=*P. alutaria* Burt, Ann. Miss. Bot. Gard., 12 : 332, 1925)

H. detritica (Bourd.) Eriksson (=*P. detritica* Bourd., Revue sc. du Bourdot, 23 : 13, 1910)

H. hastata (Litsch.) Eriksson (=*P. hastata* Litsch., Österr. Bot. Zeitschr., 77(2) : 130, 1928)

H. pallidula (Bres.) Eriksson (=*Gonatobotrys pallidula* Bres., Ann. Myc., 1 : 127, 1903)

H. subalutacea (Karst.) Eriksson (=*Corticium subalutaceum* Karst., Medd. Soc. F. Fl. Fenn., 9 : 65, 1883)

H. abieticola (Bourd. et Galz.) Eriksson (=*Odontia barbajovis* ssp. *abieticola* Bourd. et Galz., Hym., Fr. 426, 1927)

**H. alutacea* (Fr.) Eriksson (=*Hydnum alutaceum* Fr., Syst. Myc., 1 : 417, 1821)

**H. arguta* (Fr.) Eriksson (=*H. argutum* Fr., Syst. Myc., 1 : 424, 1821)

**H. aspera* (Fr.) Eriksson (=*Grandinia aspera* Fr., Hym. Eur., 647, 1874)

**H. barba-jovis* (Sw. ex Fr.) Eriksson (=*Hydnum barbajovis* Sw. ex Fr., Syst. Myc., 1 : 421, 1821)

H. breviseta (Karst.) Eriksson (=*Kneiffia breviseta* Karst., Hedw., 25 : 232, 1886)

H. bugellensis (Ces. ap. Klotzsch-Rah.) Eriksson (=*O. bugellensis* Ces. ap. Klotzsch-Rah., Herb. viv. Myc. n. 1915)

**H. crustosa* (Pers. ex Fr.) Eriksson (=*Hydnum crustosum* Pers. ex Fr., Syst. Myc., 1 : 419, 1821)

H. floccosa (Bourd. et Galz.) Eriksson (=*O. alutacea* ssp. *floccosa* Bourd. et Galz., Hym. Fr., 423, 1927)

**H. papillosa* (Fr.) Eriksson (=*Thelephora papillosa* Fr., Elench., 1 : 212, 1828)

H. pilaecystidiata (Lundell in Lundell et Nannf.) Eriksson (=*O. pilaecystidiata* Lundell in Lundell et Nannf., Fung. exs. suec. n. 2146 fase. 43～44 : 24～25, 1953)

**H. quercina* (Fr.) Eriksson (=*Radulum quercinum* Fr., Hym. Eur., 623, 1874)

According to the result of experiments performed by the writer, each of the species has tramal structure in the spine, and sterile at the apices representing absolute character of the Hydnaceae as shown in Fig. 1. Therefore, the writer transferred their nomenclatural status

from *Hyphodontia* Eriksson to *Odontia* Fr.. They are the following taxa : *H. alutacea*, *H. arguta*, *H. aspera*, *H. barba-jovis*, *H. crustosa* and *H. papillosa*. *H. quercina* was transferred to *Basidioradulum* Nobles.

Phlebia Fries emend Donk

Donk, Fungus, 27 : 9, 1957; Fries, Syst. Myc., 1 : 426, 1821; Karsten, Myc. Fennica, Basidiomycetes 13, 1876; Christiansen, Dansk Bot. Arkiv, 19(2) : 161, 1960.

Basidiocarps resupinate, thin to slightly thick, usually closely adnate, waxy, gelatinous to mucous, indurating or, if different, shrinking to a varnish like film upon drying, hyaline to often more or less notably colored when fresh; surface continuous, smooth or folded, sometimes tuberculate, or granular by crystal conglomerations. Basal layer poorly to rather strongly developed and compact. Hymenium notably thickening, producing basidia only, or in addition, various kinds of cystidia which originate together with the basidia at the surface, become included, and either obliterate or continue their development; the structure of older portions indistinct. Cystidia lacking, or, if present, originally, more or less projecting, either obliterating or becoming thick-walled. Basidia rather small, slender-clavate, 2～4 spored, sterigmata short. Basidiospores ovoid, ellipsoid, or subcylindrical, adaxially flattened to depressed, with sublateral apiculus, small, smooth, hyaline, non-amyloid.

Type species : *Phlebia radiata* Fr. (selected by Donk)

Family : Corticiaceae.

Note.

The genus *Phlebia* was grouped under family Meruliaceae by Cooke (1957) and Gäuman (1964).

V Description of Japanese genera and species

The total number of the species in this roport is 44, belonging to 6 genera. The description of genera and species is as follows :

1. *Odontia* Fries

Fries, Epic. Myc., 528, 1836～1838; Karsten, Myc. Fennica, Basidiomycetes, 14, 1876; Eriksson, Symb. Bot. Upsal., 16(1) : 124, 1958; Christiansen, Dansk Bot. Arkiv 19(2) : 245, 1960; Nikolajeva, Fl. Pl. Crypt. URSS 6(2) : 100, 1961; Miller, Mycologia, 25 : 292, 1933; S. Ito, Fl. Myc. Japan, 2(4) : 186, 1955.

Basidiocarps annual, resupinate, effused, membranous, floccose, crustaceous or rarely ceraceous, sometimes pruinose; Spines variable, subulate, conical, tuberculate or cylindrical, with sterile; Subiculum composed of an intermediate layer of intertwined hyphae and a basal layer of parallel hyphae; Tramal structure present at the axis of the spine; Hyphal system monomitic; Generative hyphae with walls hyaline, naked or incrusted, branched, septate, with or without clamp connections; Cystidia either in the form of incrusted hyphae or arranged in fascicles at apices of spines, fusiform or cylindrical and incrusted or naked; Gloeocystidia absent; Basidia subclavate or clavate, bearing. 2～4 spored on erect sterigmata; Spores globose to allantoid, walls smooth, hyaline, non-amyloid.

Type species : *Odontia fimbriata* Fries

Family : Hydnaceae.

Habitat : Growing on wood.

Japanese name : Komeharitake-zoku.

Note.

With respect to the type species of the genus *Odontia*, FRIES (Epic., 528, 1836～1838) designated *O. fimbriata*.

Key to Japanese species of the genus *Odontia*

Group I : Cystidia arising from specialized axial hyphae of the spine, usually elongated, fusiform or cylindrical, with thickened wall.

A 1 : Cystidia heavily incrusted.

B 1 : Basidiocarps separable, with numerous rhizomorphic strands, spores, elliptical, 2.5～3×4～4.5μ ……*O. fimbriata* (1)

B 2 : Basidiocarps ceraceous, without rhizomorphic strands, spores ellipsoid, 2～2.5×4～4.5μ ……*O. ciliolata* (2)

B 3 : Basidiocarps subfloccose to subceraceous, without rhizomorphic strands, cystidia septate with clamp connections, spores cylindrical, 3.5～4×7.5～8μ……*O. setigera* (3)

A 2 : Cystidia smooth, basidiocarps floccose, spores 3～4×5～5.5μ……*O. barba-jovis* (4)

Group II : Cystidia arising from specialized terminal hyphae, variable in shape, thin-walled.

A 1 : Two distinct types of cystidia present.

B 1 : Basidiocarps tomentose or floccose.

C 1 : One type of cystidia fusiform with incrusted terminations, and another cylindrical with obtuse or slightly enlarged, smooth or incrusted terminations, spores obovate, 4～5×5～6.5μ……*O. arguta* (5)

C 2 : One type of cystidia lanceolate, and another cylindrical, both types smooth, spores ellipsoid, 2～2.5×4μ ……*O. byssoideum* (6)

B 2 : Basidiocarps membranaceous.

C 1 : One type of cystidia capitulate, and another lanceolate, both types smooth, spores obovate, 4～5×5～6μ ……*O. aspera* (7)

B 3 : Basidiocarps ceraceous.

C 1 : One type of cystidia terminating in a globose enlargement, covered with radiating crystals at apices, another containing a yellowish material at apices, spores broadly elliptical, 3～3.5×5～6μ……*O. bicolor* (8)

C 2 : One type of cystidia capitulate, not incrusted, another cylindrical, incrusted, spores ellipsoid, 4～5×5～6μ……*O. subspathulata* (9)

A 2 : Both cystidia and cystidioles present.

B 1 : Cystidia cylindrical, slightly incrusted, cystidioles ventricose-rostrate or clavates, spores ellipsoid, 3～4×4～6μ……*O. rimosissima* (10)

A 3 : Only one type of cystidia present.

B 1 : Basidiocarps tomentose or floccose.

C 1 : Cystidia cylindrical or clavate, more than 2μ wide.

D 1 : Cystidia cylindrical, septate, with clamp connections, projecting in apex of the spine, spores cylindrical, 2～2.5×6～8μ……*O. alutacea* (11)

D 2 : Cystidia claviform, projecting in apex of the spine, spores ovoid, 3～4×5～6μ……*O. stipata* (12)

D 3 : Cystidia cylindrical or long clavate, projecting in hymenial surface and apex of the spine, spores ellipsoid, 4～5×5～6μ……*O. irregularis* (13)

C 2 : Cystidia capitulate, very narrow, less than 2μ wide, spores allantoid, 1～2×5～6μ……*O. verruca* (14)

B 2 : Basidiocarps membranaceous.

C 1 : Cystidia fusiform or cylindrical.

D 1 : Cystidia elongated, cylindrical, not incrusted, spores ellipsoid, 2.5×4～5μ……*O. rufobrunneus* (15)

D 2 : Cystidia cylindrical, septate, with clamp connections, spores ellipsoid, 3～3.5×5～6μ……*O. subalutacea* (16)

D 3 : Cystidia fusiform or cylindrical and minutely capitate, spores oblong, 2.5×5μ……*O. papillosa* (17)

D 4 : Cystidia cylindrical, spores reniform, 4×10～11μ……*O. transiens* (18)

C 2 : Cystidia tibiiform or clavate.

D 1 : Cystidia tibiiform, faintly incrusted at the apex, spores ellipsoid, 3～4×5～6μ……*O. ochraceum* (19)

D 2 : Cystidia clavate, spores oblong-ellipsoid to fusiform-elliptical, 3.5～5×12～15μ……*O. longospora* (20)

B 3 : Basidiocarps ceraceous.

C 1 : Cystidia cylindrical, confined to apices of the spines.

D 1 : Cystidia aggulutinated by a resin-like material into a more or less compact, viscid fascicle, spores cylindrical, curved, 1～1.5×6～8μ……*O. sudans* (21)

D 2 : Cystidia in loose terminal tufts, heavily incrusted.

E 1 : Spines rigid, strongly hispid at the apex, spores ellipsoid, 4×5μ……*O. livida* (22)

E 2 : Spines short, weakly divided in the apex of the spine, spores ellipsoid, 3～4×4～6μ……*O. crustula* (23)

C 2 : Cystidia cylindrical or clavate, both at apices and in hymenial layer of spines.

D 1 : Cystidia cylindrical, sometimes septate, spores globose, 4～5×4～5μ……*O. lanceolatum* (24)

D 2 : Cystidia clavate, spores very small, globose, 2～2.5×3.5～4μ……*O. subabrupta* (25)

C 3 : Cystidia subulate.

D 1 : Cystidia 6～13μ wide, 40～90μ long, heavily incrusted, spores ovoid, 3～4×5～5.5μ……*O. queletii* (26)

D 2 : Cystidia 3～4μ wide, not incrusted, spores ellipsoid, 3.5～4×5～7.5μ…*O. crustosa* (27)

C 4 : Cystidia capitulate or lecythiform.

D 1 : Cystidia capitulate, spores subfusiform, 3.5～4×7.5～8.5μ……*O. macroverruca* (28)

D 2 : Cystidia lecythiform, spores ellipsoid, 3.5×5.5μ……*O. pelliculae* (29)

C 5 : Cystidia mucronate, spores elliptical, 5×7.5～9μ……*O. mucronata* (30)

Group III : Cystidia some slender hyphoid, projecting at the apices of the spines.

A 1 : Basidiocarps ceraceous, spines variable in shape, subulate, cylindrical or spathulate, spores ellipsoid, 3～4×4×6μ……*O. spathulata* (31)

1) ***Odontia fimbriata*** (PERSOON) FRIES (Fig. 2, Pl. 1, A, B)

Epic., 528, 1836～1838, Hym. Eur., 627, 1874; SACCARDO, Syll. Fung., 6 : 506, 1888; MILLER, Mycologia, 26 : 17, 1934; BROWN, Bot. Gaz., 96 : 665, 1935; CUNNINGHAM, Tran. Roy. Soc. New Zealand, 86 : 86, 1959.

Synonym : *Hydnum fimbriatum* PERSOON ex FRIES, Syst. Myc., 1 : 421, 1821.

Mycoleptodon fimbriatum (Fr.) Bourdot et Galzin, Bull. Soc. Myc. Fr., 30 : 276, 1914, Hym. Fr., 441, 1927; Christiansen, Friesia, 4 : 303, 1952～1953; Nikolajeva, Fl. Pl. Crypt. URSS 6(2) : 148, 1961.

Steccherinum fimbriatum (Pers. ex Fr.) Eriksson, Symb. Bot. Upsal., 16(1) : 134, 1958; Christiansen, Dansk Bot. Arkiv, 19(2) : 328, 1960.

Macroscopic characters.

Basidiocarps resupinate, widely effused, thin, membranaceous, coriaceous, easily separated from substratum, not cracked in dried specimens, with rhizomorphic strands, spreading under the bark or on decayed wood, vinaceous buff; Hymenial surface vinaceous buff to pale ochraceous buff; Margin fibrillose and rhizomorphic, white to vinaceous buff; Spines irregular, warted to short subulate, angular with broad bases and hispid or crested at apices, not crowded, 0.5 mm long; Subiculum thin, soft, white to pale ochraceous buff, 60～100 μ thick.

Microscopic characters.

Subiculum hyphae compactly arranged, with slightly thickened wall, with clamp connections, 4～5 μ wide; Tramal hyphae compactly arranged, thin-walled, sometimes branched, with clamp connections, 2.5～3 μ wide; Cystidia crowded in spine, sometimes confined to the apices of spines, clavate, cylindrical or obtuse, thick-walled, heavily incrusted, projecting 20～30 μ, 7～10×50～80 μ; Basidia clavate, 4～5×12～18 μ, 2～4 spored; Basidiospores ellipsoid, smooth, hyaline, 2.5～3×4～4.5 μ.

Habitat : Growing on bark of branches and stem of dead broad-leaved trees, associated with a white rot.

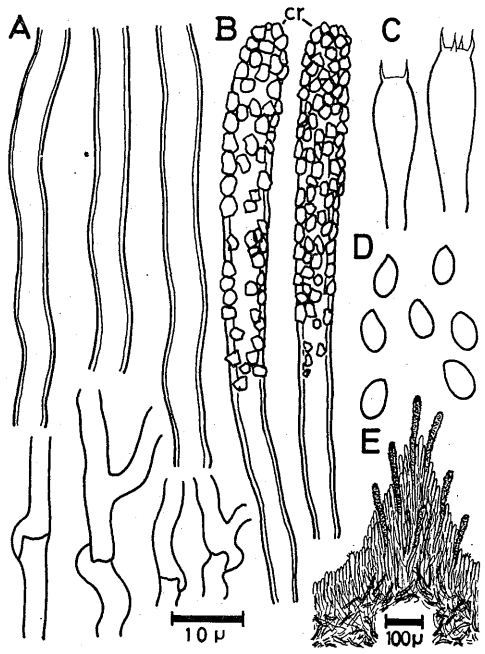

Fig. 2 Microscopic elements of *Odontia fimbriata* (Pers.) Fr. (F-11258)
A : Subiculum hyphae B : Cystidia
C : Basidia D : Basidiospores
E : Long section of spine
cr : Crystals on the surface of cystidia

Japanese name : Himotsuki-komebatake (Furukawa).

Type locality : Europe.

Distribution : Europe, North America, New Zealand and Asia (Japan, USSR).

Specimens examined.

Matsunoyama, Niigata pref., on *Quercus*, 13-IX-1964, K. A. & Y. H., (F-11258); Yachi, Towada, Aomori pref., on broad-leaved tree, 26-IX-1964, Y. H., (F-11332); Kiyosumi, Chiba pref., on broad-leaved tree, 24-X-1967, K. A., Y. H. & H. F., (F-11333); 2-gôme, Fuji, Narusawa, Yamanashi pref., on broad-leaved tree, 6-X-1964, H. F. & T. K., (F-11334); Nobeyama, Nagano pref., on bark of dead *Quercus*, 15-IX-1961, K. A., (F-11335); Sugadaira, Nagano pref., on broad-leaved tree, 3-X-1969, Y. H., (F-11337); Sugadaira, Nagano pref., on dead branch of *Quercus*, 3-X-1961, Y. H., (F-11338); Akazawa, Agematsu, Nagano pref., 20-VIII-1962, K. A., Y. H. & H. F., (F-11336).

Note.

This species is recognized by its charac-

teristic rhizomorphic strands. The apex of spines has hymenial layers and has protruded cystidia. The shape of cystidia resembles very much that of *Steccherinum ochraceous* (Pers.) S. F. Gray, but is larger.

Bourdot & Galzin (1927) placed this species under the genus *Mycoleptodon* Pat. (Type species : *Hydnum pudorinum* Fr.) and Nikolajeva (1961) accepted this treatment. On the other band, Eriksson (1958) and Christiansen (1960) adopted *Steccherinum* S. F. Gray (Type species : *Hydnum ochraceum* Pers. =*Hydnum pudorinum* Fr.) for this species. But, *O. fimbriata* has a monomitic hyphal system, whereas the genus *Steccherinum* has a dimitic hyphal system.

2) ***Odontia ciliolata*** (**Berkeley et Curtis**) **Miller** (Fig. 3, Pl. 1, C, D)

Mycologia, 26 : 18, 1934; Nikolajeva, Fl. Pl. Crypt. URSS 6(2) : 108, 1961.

Synonym : *Hydnum ciliolatum* Berkeley et Curtis, Hooker's Jour. Bot. & Kew Gard. Misc., 1 : 235, 1849; Sacc., Syll. Fung., 6 : 467, 1888.

Macroscopic characters.

Basidiocarps annual, resupinate, widely effused, thin, less than 1 mm thick, hard, ceraceous, adnate, cracking in drying, light buff to light ochraceous buff, ochraceous buff in old specimens; Margin finely fimbriate, without sterile areas; Spines crowded, slender, cylindric, tapering to the tip, the apices finely fimbriate, 0.2～0.6 mm long, 0.1 mm diam., 7～8 spines per 1 mm; Subiculum very thin, pale buff, 100～150μ thick.

Microscopic characters.

Subiculum hyphae compactly arranged, thin-walled hyphae, frequently branched, with frequent clamp connections, 2.5～3.5μ wide, slightly thick-walled hyphae rarely branched, often incrusted, with clamp connections, 3.5～4μ wide, apparently ending in incrusted cystidia; Cystidia abundant, scattered along sides of spines and at apices, heavily incrusted, thick-walled, completely imbedded or projecting from the hymenium, sometimes in clusters, 6～8×35～60μ; Basidia clavate, 4-spored, 4～5μ wide; Basidiospores ellipsoid, smooth, hyaline, 2～2.5×4～4.5μ.

Habitat : Growing on dead coniferous and broad-leaved trees, associated with a white rot.

Japanese name : Fusatsuki-komebatake (Furukawa).

Type locality : North America.

Distribution : North America, Europe and Asia (Japan).

Specimens examined.

Aoidake, Miyazaki pref., on bark of *Distylium racemosum*, 13-X-1963, K. A. & H. F., (F-11261); Sata, Kagoshima pref. on dead

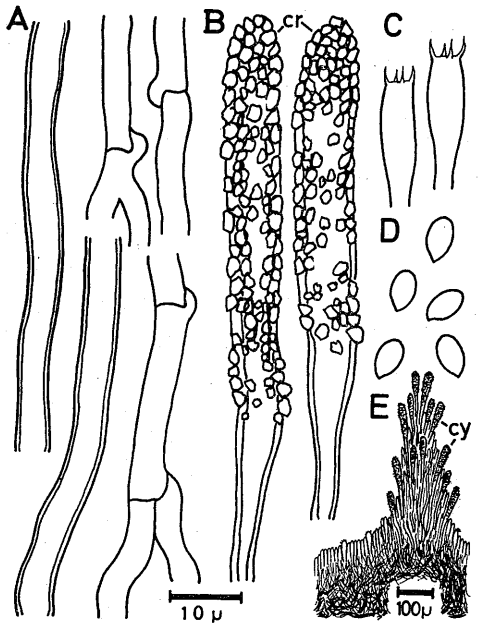

Fig. 3 Microscopic elements of *Odontia ciliolata* (Berk. et Curt.) Miller (F-11261)
A : Subiculum hyphae B, cy : Cystidia
C : Basidia D : Basidiospores
E : Long section of spine
cr : Crystals on the surface of cystidia

branch of broad-leaved tree, 18-X-1966, H. F., (F-11262).

Note.

As stated by MILLER (1934b), cystidia of this species resemble in shape those of *O. fimbriata* FR., which has no rhizomorphic strands and has different shape of spines.

GILBERTSON (1965) examined the Iso-type specimen of *Hydnum ciliolatum* BERK. et CURT. in detail. He agreed with the opinion expressed by MILLER.

3) ***Odontia setigera*** **(FRIES) MILLER** (Fig. 4, Pl. 1, E, F)

Mycologia, 26 : 19, 1934; BROWN, Bot. Gaz., 96 : 666, 1935; S. ITO, Myc. Fl. Japan, 2(4) : 186, 1955; NIKOLAJEVA, Fl. Pl. Crypt. URSS 6(2) : 106, 1961; FURUKAWA & AOSHIMA, Trans. mycol. Soc. Japan, 7(2～3) : 152, 1966.

Synonym : *Thelephora setigera* FRIES, Elench. Fung., 1 : 208, 1828.

Kneiffia setigera (FR.) FR., Epic., 529, 1836～1838; SACCARDO, Syll. Fung., 6 : 510, 1888.

Peniophora setigera (FR.) BRESADOLA, Hym. Fung. Kmet., 40, 1897; v. HOEHNEL & LITSCHAUER, Ann. Myc., 4 : 289, 1900; BOURDOT & GALZIN, Bull. Soc. Myc. Fr., 28 : 399, 1912, Hym. Fr., 309, 1927; PILÁT, Bull. Soc. Myc. Fr., 51 : 418, 1938.

Hyphoderma setigera (FR.) DONK, in ERIKSSON, Symb. Bot. Upsal., 16(1) : 98, 1958; CHRISTIANSEN, Dansk Bot. Arkiv, 19(2) : 201, 1960.

Odontia acerina PECK, N. Y. State Mus. Rep., 53 : 847, 1900, in GILBERTSON, Mycologia, 54 : 659, 1962.

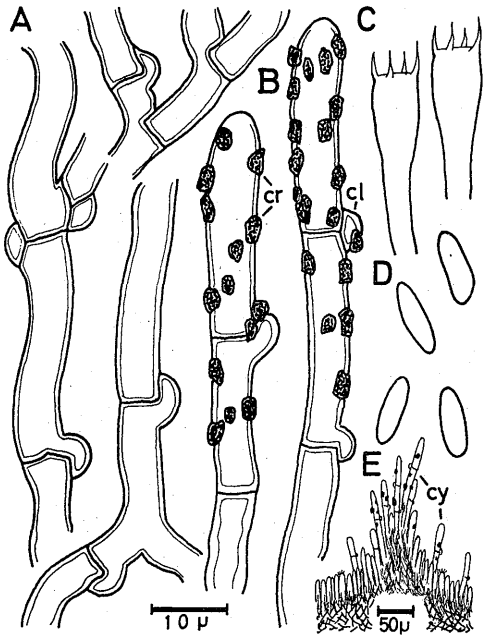

Fig. 4 Microscopic elements of *Odontia setigera* (FR.) MILLER (F-10696)
A : Subiculum hyphae　B, cy : Cystidia
C : Basidia　D : Basidiospores
E : Long section of spine
cr : Crystals on the surface of cystidia
cl : Clamp connections

Macroscopic characters.

Basidiocarps annual, resupinate, widely effused, adnate, at first thin, arachnoid under the lens, then thickened, floccose to slightly ceraceous, with very numerous and small crackings when dry, white to pinkish buff; Margin thin, arachnoid or floccose, white; Spines conical, not sharp-pointed, slightly hispid at the apex, short, 0.1～0.2 mm diam., 0.1～0.5 mm long, 5～6 spines per 1 mm; Subiculum thin, soft, pinkish buff, 0.3～0.4 mm thick.

Microscopic characters.

Subiculum hyphae loosely arranged thin-walled, branched, with numerous clamp connections, 3～5μ wide; Cystidia very big, cylindrical, 3～4 septate, with clamp connections, projecting 40～80μ long at the apex of the spine, at first naked, becoming incrusted with coarse crystals; Basidia clavate, 7～8×15～25μ, 2～4 spored; Basidiospores ellipsoid to cylindrical, smooth, hyaline, 3.5～4×7.5～8μ, often one guttulate.

Habitat : Growing on both deciduous and coniferous trees, associated with a white rot.

Japanese name : Shiro-komebatake.

Distribution : Europe, North America and Asia (Japan, USSR).

Specimens examined.

Utsunomiya, Tochigi pref., on bark of *Quercus* sp., 9-X-1965, S. Omori, (F-10696); Shikotsu, Hokkaido, on *Quercus*, 10-VIII-1963, K. A., Y. H. & T. K., (F-11362, F-11363); Yamabe, Hokkaido, on broad-leaved tree, 16-VIII-1963, K. A., Y. H. & T. K., (F-11364); Teshirozawa, Yazima, Akita pref., on bark of dead *Quercus*, X-1962, T. K., (F-11365); Kiyosumi, Chiba pref., on bark of dead *Quercus*, 24-X-1967, K. A., Y. H. & H. F., (F-11237); Matsunoyama, Niigata pref., on bark of dead *Quercus*, 13-IX-1964, K. A. & Y. H., (F-11293, F-11366); Kaida, Nagano pref., on broad-leaved tree, 3-IX-1963, Y. H. & H. F., (F-11214); Tochuuzan, Misakubo, Shizuoka pref., on bark of coniferous tree, 14-XI-1961, K. A. & Y. H., (F-11367); Ashu, Kyoto pref., on branch of dead broad-leaved tree, VII-1964, H. F. & T. K., (F-10773); Amamiooshima, Kagoshima pref., on bark of dead broad-leaved tree, 20-I-1968, Y. H., (F-11368).

Note.

The most important morphological character of this species is that it has large cystidia embracing the septa and clamps at the apical parts of the spines.

In Japan, it is distributed widely from Hokkaido to the southern end of Kagoshima pref.

As regards the genus under which this species should be classified and its synonymous relation, various opinions have been expressed by many scholars.

This species was firstly described in 1828 by Fries in Elenchus Fungorum under the name of *Thelephora setigera* Fr.

4) ***Odontia barba-jovis*** **(Swartz ex Fr.) Fries** (Fig. 5, Pl. 1, G, H)

Epic., 528, 1836～1838, Hym. Eur., 627, 1874; Saccardo, Syll. Fung., 6 : 506, 1888; Bourdot et Galzin, Hym. Fr., 425, 1927; Pilát, Bull. Soc. Myc. Fr., 49 : 299, 1933, 51 : 397, 1935; Miller, Mycologia, 26 : 23, 1934; Nikolajeva, Fl. Pl. Crypt. URSS 6(2) : 109, 1961; Cunningham, Tran. Roy. Soc. New Zealand, 86 : 101, 1959.

Synonym : *Hydnum barba-jovis* Sw. ex Fr., Syst. Myc., 1 : 421, 1821.

Hydnum nyssae Berkeley & Curtis, Grevillea, 1 : 100, 1873, in Gilbertson, Mycologia, 57 : 1965.

Hyphodontia barba-jovis (Sw. ex Fr.) Eriksson, Symb. Bot. Upsal., 16(1) : 104, 107, 1958.

Macroscopic characters.

Basidiocarps annual, resupinate, widely effused, soft, floccose to tomentose, not easily separable from the substratum, white to pinkish buff; Margin floccose, white to pinkish buff; Spines crowded, soft, slender, blunt or subulate, apices strongly fimbriate, variable in size, 0.5～3 mm long; Subiculum very thin, soft farinaceous, 0.1～0.2 mm thick.

Microscopic characters.

Subiculum hyphae mixed with thin-walled hyphae and few hyphae with slightly thickened walls, loosely arranged, thin-walled hyphae with frequent branchings, clamp connections present, 2.5～3.5 μ wide, slightly thick-walled hyphae septate, but without clamp connections, 3.5～5 μ wide; Cystidia abundant, greatly elongated, cylindrical, thick-walled, with the walls thinning out near the apex, 4～6 μ wide and projecting 25～60 μ long, in dense clusters at apices of the spines; Basidia clavate, 3～6×15～25 μ, 4-spored; Basidiospores ovoid to broadly ellipsoid, smooth, hyaline, 3.5～4×5～5.5 μ, often 1 guttulate.

Habitat : Growing on bark of deciduous trees, associated with a white rot.

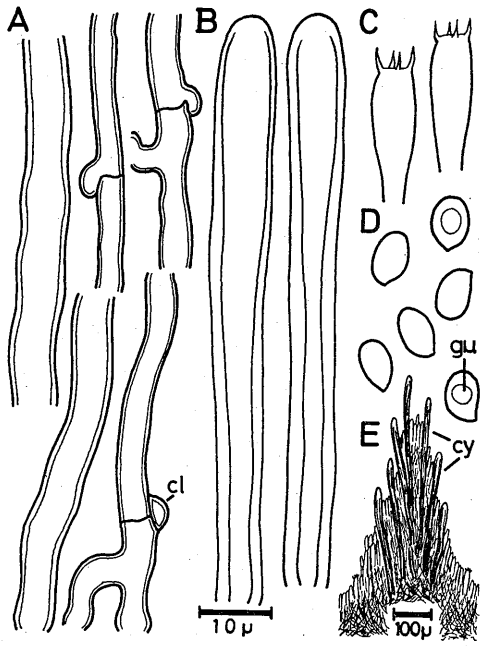

Fig. 5 Microscopic elements of *Odontia barba-jovis* (Schw. ex Fr.) Fr. (F-11264)
A : Subiculum hyphae B, cy : Cystidia
C : Basidia D : Basidiospores
E : Long section of spine
cl : Clamp connections gu : Guttulate

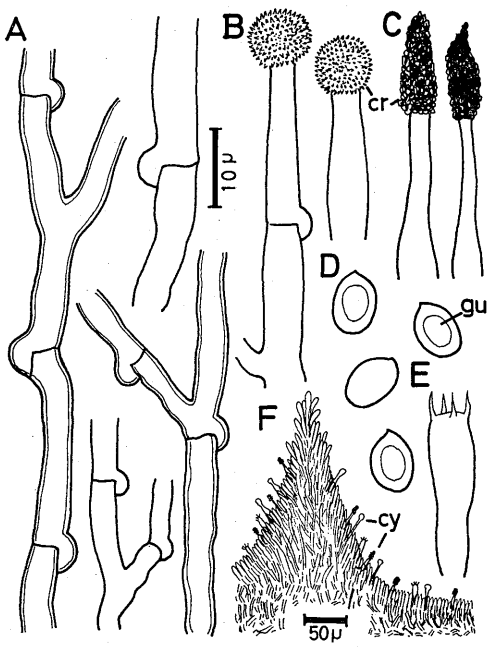

Fig. 6 Microscopic elements of *Odontia arguta* (Fr.) Quél. (F-10604)
A : Subiculum hyphae B, C, cy : Cystidia
D : Basidiospores E : Basidia
F : Long section of spine
cr : Crystals on the surface of cystidia
gu : Guttulate

Japanese name : Wata-komebatake-modoki (Furukawa).

Type locality : England.

Distribution : Europe, North America, New Zealand and Asia (Japan, USSR).

Specimen examined.

Nobeyama, Nagano pref., on bark of dead broad-leaved tree, 15-IX-1961, K. A., (F-11264).

Note.

This species has long, cylindrical cystidia which project in dense clusters at apices of the spines.

O. setigera (Fr.) Quél. has the same type of cystidia, but the cystidia of *O. barba-jovis* (Sw. ex Fr.) Fr. is larger and longer.

5) ***Odontia arguta*** **(Fries) Quélet** (Fig. 6, Pl. 2, A, B)

Fl. Myc. Fr., 435, 1888; Bourdot & Galzin, Hym. Fr., 427, 1927; Pilát, Bull. Soc. Myc. Fr., 49 : 299, 1933, 51 : 397, 1935; Miller, Mycologia, 26 : 26, 1934; Brown, Bot. Gaz., 96 : 647, 1935; Christiansen, Friesia, 4 : 323, 1952; Cunningham, Tran. Roy. Soc. New Zealand, 86 : 91, 1959; Nikolajeva, Fl. Pl. Crypt. URSS 6(2) : 110, 1961; Furukawa & Aoshima, Trans. mycol. Soc. Japan, 7(2～3) : 149, 1966.

Synonym : *Hydnum argutum* Fries, Syst. Myc., 1 : 424, 1821, Hym. Eur., 616, 1874.

Hyphodontia arguta (Fr.) Eriksson, Symb. Bot. Upsal., 16(1) : 104, 1958; Christiansen, Dansk Bot. Arkiv, 19(2) : 226, 1960.

Macroscopic characters.

Basidiocarps annual, resupinate, widely effused, thin, soft, fragile, adnate, floccose to membraneous, pruinose when dry; Hymenial surface cartridge buff to cinnamon buff; Margin thinning out, floccose, white; Spines crowded, variable in shape, at first short, then cylindrical or subulate, pointed, divided or penicillate at the apex, finely pubescent, 1～2 mm long; Subiculum thin, cinnamon buff, 150～200 μ thick.

Microscopic characters.

Subiculum hyphae distinct, loosely arranged, thin-walled, sometimes branched, with clamp connections, 2.5～4 μ wide; Tramal hyphae as in subiculum; Cystidia of two types, the one abundantly observed, projecting from the hymenial layer, some fusiform or subulate, with incrusted termination, 2～3 μ wide, 10～15 μ long, the other cylindrical, with obtuse or slightly enlarged, smooth or incrusted terminations, 4～5 μ wide, 20～25 μ long; Basidia clavate, 5～6×12～18 μ, 4-spored; Basidiospores obovate, smooth, hyaline, 4～5×5～6.5 μ, sometimes one guttulate.

Habitat : Growing on barks, branches and stems of coniferous and broad-leaved trees, associated with a white rot.

Japanese name : Herabatake-modoki (Furukawa & Aoshima).

Type locality : Europe.

Distribution : Europe, Africa, North America, New Zealand and Asia (Japan, USSR).

Specimens examined.

Tuchiyu, Fukushima pref., on bark of *Cryptomeria japonica*, 20-X-1948, K. A., (F-10604); Tomakomai, Hokkaido, on bark of *Picea jezoensis*, 21-IX-1962, Y. H., (F-11230); Yamabe, Hokkaido, on coniferous tree, 24-IX-1962, Y. H., (F-11234); Shikotsu, Hokkaido, on broad-leaved tree, 10-VIII-1963, K. A., Y. H. & T. K., (F-10747); Chichibu, Saitama pref., on stem of broad-leaved tree, 11-XI-1969, K. A., Y. H. & T. K., (F-11329); Matsunoyama, Niigata pref., on coniferous tree, 13-IX-1964, K. A. & Y. H., (F-11227); Kiyosumi, Chiba pref., on bark of coniferous tree, 24-X-1967, K. A., Y. H. & H. F., (F-11330); Asakawa, Tokyo, on bark of *Abies firma*, 6-X-1965, H. F., (F-11226); Asakawa, Tokyo, on stem of broad-leaved tree, 6-X-1965, H. F., (F-10772); Asakawa, Tokyo, on bark of *Quercus acutissima*, 6-X-1965, H. F., (F-10741); Minamitama, Tokyo, on bark of *Quercus* sp., 25-X-1965, K. A., (F-11223); Asakawa, Tokyo, on stem of coniferous tree, 15-X-1966, H. F., (F-11225); Narusawa, Yamanashi pref., on bark of *Quercus* sp., 28-VIII-1965, K. A. & T. K., (F-11235); Senzu, Shizuoka pref., on stem of coniferous tree, VIII-1949, K. A., (F-10746); Tochuzan, Shizuoka pref., on broad-leaved tree, 14-XI-1961, K. A. & Y. H., (F-11224); Ashu, Kyoto pref., on bark of *Cryptomeria japonica*, VII-1964, H. F. & T. K., (F-11228); Hirai, Kozagawa, Wakayama pref., on bark of broad-leaved tree, 30-VII-1967, H. F., (F-11328); Hetsuka, Uchinoura, Kagoshima pref., on broad-leaved tree, XI-1962, K. A., (F-11331).

Note.

This species resembles *Odontia spathulata* (Schrad. ex Fr.) Litsch., but is different distinctively in the characters of cystidia. *O. arguta* has much more floccose textures and pubescent appearance of the surface of the fruit bodies. The hymenial cystidia with incrusted terminations separate it readily from other related species of *Odontia*.

This species is distributed widely from Hokkaido to Kagoshima. A specimen collected in Kagoshima has thicker subiculum and longer spines compared with those collected in Hokkaido and Honshu.

Just as pointed out by Miller (1934b) and Cunningham (1959), this species is characteristic

in that its spine tip becomes brush-like in shape. However, many specimens collected in Japan examined by the writer were not so remarkable in this respect.

Eriksson (1958) adopted *Hyphodontia* for this species and made a new combination of *H. arguta* (Fr.) Eriksson.

6) ***Odontia byssoideum*** **Furukawa** sp. nov. (Fig. 7, Pl. 2, C, D)

Basidiocarpus resupinatum, late effusum, tenuis, admodum lenis, floccosus, calidus luteum; Margo floccosus, tenuis, lenis, calidus luteum; Spinae conicum vel cylindraceus, non acris aculeatus, minus clare fimbriatus, 0.1～0.3 mm longae; Subiculum tenuis, lenis, calidus luteum; Subiculum hyphae leptodermus, 2.5～4μ diam., fibulis destitutus, admodum paniculatus; Cystidia lanceolatus, crassitunicatus, acris aculeatus, 4μ diam., adius longus cylindraceus, non aculeatus, 5μ diam., Basidia clavata, 5×17μ; Sporae ellipsoideus, laevis, hyalinus, 2～2.5×4μ, non-amyloideus.

Macroscopic characters.

Basidiocarps resupinate, widely effused, loosely adnate, thin, soft, loose and floccose, warm buff to antimony yellow; Margin floccose, thin, soft, white to warm buff; Spines conical to short cylindrical, not sharp pointed, sometimes slightly fimbriate, 0.1～0.3 mm long, 4～5 spines per 1 mm; Subiculum soft, warm buff, 0.5 mm thick.

Microscopic characters.

Subiculum hyphae loosely arranged, thin-walled, without clamp connections, frequently branched, sometimes incrusted, 2.5～4μ wide; Cystidia of two types, abundant, both types at the apex of the spine and on hymenium, the one lanceolate, thick-walled, sharp pointed, 4μ wide, projecting up to 60μ long, the other long cylindrical, not pointed, slightly thick-walled, not incrusted, 5μ wide, projecting 30～60μ long; Basidia clavate, 4-spored, 5×17μ; Basidiospores ellipsoid, smooth, hyaline, 2～2.5×4μ, non-amyloid.

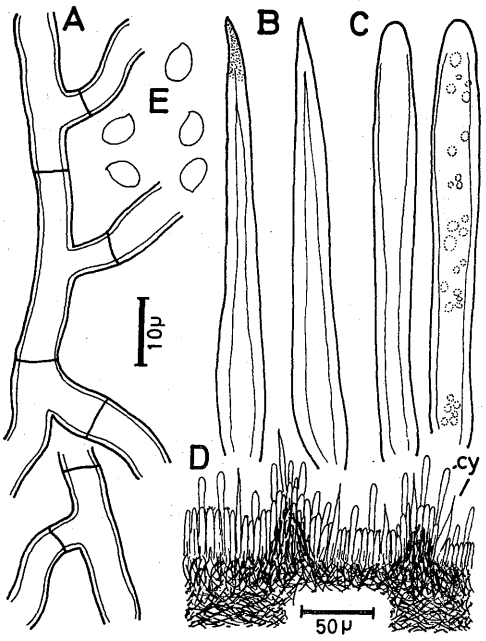

Fig. 7 Microscopic elements of *Odontia byssoideum* Furukawa (F-11321)
A : Subiculum hyphae B, C, cy : Cystidia
D : Long section of spine
E : Basidiospores

Habitat : On bark of branches and stems of broad-leaved trees, associated with a white rot.

Japanese name : Nise-wata-komebatake (Furukawa).

Distribution : Asia (Japan).

Specimen examined.

Aoidake, Miyazaki pref., on hardwood, 13-X-1963, K. A. & H. F., (F-11321 Type).

Note.

The tissue of fruit body of this species is rather soft and its surface is floccose. In these points, it resembles *O. stipata* (Fr.) Quél. and *O. barba-jovis* (Sw. ex Fr.) Fr., but *O. barba-jovis* has white to pinkish buff colored tissue of the fruit body. Microscopically,

it has two types of cystidia; the one is long and cylindrical in shape, while the other lanceolate. In addition, its spore is very small. Therefore, it is quite different from the two species mentioned above.

Only one collection was made on Aoi plateau in Miyazaki prefecture.

7) ***Odontia aspera*** (**FRIES**) **BOURDOT et GALZIN** (Fig. 8, Pl. 2, E, F)

Hym. Fr., 428, 1927; PILÁT, Bull. Soc. Myc. Fr., 49 : 299, 1933; NIKOLAJEVA, Fl. Pl. Crypt. URSS 6(2) : 116, 1961; CHRISTIANSEN, Friesia, 4(4～5) : 326, 1952～1953.

Synonym : *Grandinia aspera* FRIES, Hym. Eur., 627, 1874.

Hyphodontia aspera (FR.) ERIKSSON, Sym. Bot. Upsal., 16 : 104, 1958; CHRISTIANSEN, Dansk Bot. Arkiv, 19(2) : 227, 1960.

Macroscopic characters.

Basidiocarps widely effused, thin, closely adnate, fibrillose to membranaceous; Hymenial surface white to pale yellow; Margin fibrillose, white; Spines not crowded, conical or subulate, with apices pointed or sometimes slightly fimbriate, 1～1.5 mm long; Subiculum very thin, white to pale yellow, less than 0.5 mm thick.

Microscopic characters.

Subiculum hyphae distinct, loosely arranged, almost thin-walled, with clamp connections, frequently branched, 2.5～3.5μ wide; Cystidia of two types, the one capitulate, 3～4×25～30μ, swollen part 5.5μ wide, projecting 13～15μ long, the other lanceolate or lageniform, 3～4×25～30μ, projecting 15～17μ long; Basidia cylindrical or clavate, 5μ wide, 4-spored, sterigmata 5μ long; Basidiospores obovate, smooth, hyaline 4～5×5～6μ, with one guttulate.

Habitat : On dead wood of both deciduous and coniferous trees, associated with a white rot.

Japanese name : Kikona-komebatake (FURUKAWA).

Distribution : Europe and Asia (Japan, USSR).

Specimens examined.

Oguchi, Kagoshima pref., on broad-leaved tree, 13-XI-1967, T. K., (F-11239); Chichibu, Saitama pref., on broad-leaved tree, 11-X-1969, K. A., Y. H. & T. K., (F-11361).

Note.

As subiculum of this species is very thin, the host tree looks as if coated with yellow powder over its bark.

This species resembles *O. arguta* (FR.) QUÉL., but *O. aspera* has two types of naked cystidia, and its spore size is slightly larger. Furthermore, *O. aspera* is characterized in that the ramification of subiculum hyphae is made at an angle almost perpendicular.

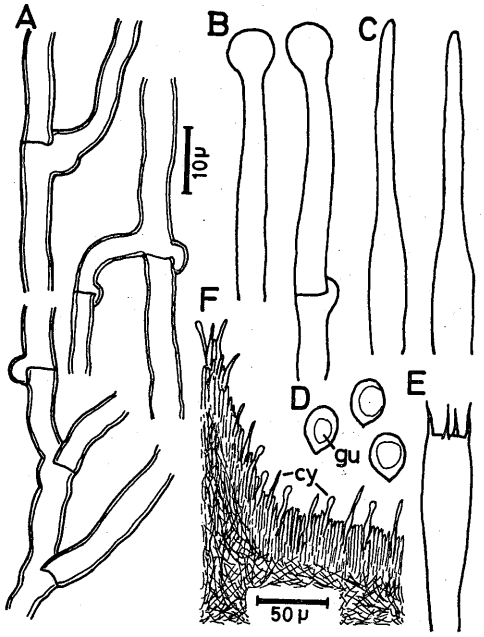

Fig. 8 Microscopic elements of *Odontia aspera* (FR.) BOURD. et GALZ. (F-11239)
A : Subiculum hyphae B, C, cy : Cystidia
D : Basidiospores E : Basidia
F : Long section of spine
gu : Guttulate

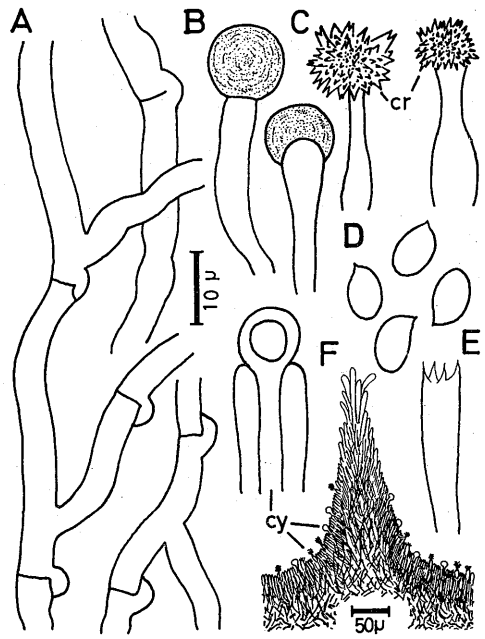

Fig. 9 Microscopic elements of *Odontia bicolor* (Alb. et Schw. ex Fr.) Bres. (F-10046)
A : Subiculum hyphae B, C, cy : Cystidia
D : Basidiospores E : Basidia
F : Long section of spine
cr : Crystals on the surface of cystidia

According to Nikolajeva (1961), this species is very rarely seen in the USSR, being distributed in European areas.

8) ***Odontia bicolor*** (**Albertini et Schweinitz ex Fries**) **Bresadola** (Fig. 9, Pl. 2, G, H)

Ann. Myc., 1 : 87, 1903; Bourdot et Galzin, Hym. Fr., 429, 1927; Miller, Mycologia, 26 : 27, 1934; Brown, Bot. Gaz., 96 : 658, 1935; Eriksson, Symb. Bot. Upsal., 16(1) : 124, 1958; Christiansen, Friesia, 4 : 318, 1952, Dansk Bot. Arkiv, 19 : 245, 1960; Imazeki & Toki, Bull. Gov. For. Exp. Sta., 67 : 27, 1954; S. Ito, Myc. Fl. Japan, 2(4) : 185, 1955; Cunningham, Trans, Roy. Soc. New Zealand, 86 : 92, 1959; Nikolajeva, Fl. Pl. Crypt. URSS 6(2) : 119, 1961; Aoshima & Furukawa, Trans. mycol. Soc. Japan, 7(2~3) : 144, 1966.

Synonym : *Hydnum bicolor* Alb. et Schw. ex Fr., Syst. Myc., 1 : 417, 1821, Hym. Eur., 615, 1874.

Macroscopic characters.

Basidiocarps resupinate, widely effused, closely adnate, thin, pruinose to ceraceous, cracked in dried specimens, white to cream or cartridge buff; Margin pruinose, white; Spines crowded, fragile, conical, obtuse or sometimes pointed, with crests at the apex, 1~3 mm long; Subiculum ceraceous, cream, 0.5 mm thick.

Microscopic characters.

Subiculum hyphae compactly arranged, thin-walled, frequently branched, with clamp connections, 2.5~3.5μ wide; Cystidia submerged or projecting, terminating in a globose enlargement, covered with radiating crystals or sometimes containing a yellowish material, 8~15×25~35μ; Basidia clavate, 3~5×10~15μ, with 4 sterigmata; Basidiospores obovate, ovate or broadly elliptical, apiculate, some flattened on one side, smooth, hyaline, 3~3.5×5~6μ.

Habitat : On dead branches and stems of coniferous and broad-leaved trees, associated with a white rot.

Japanese name : Haritake-modoki (Imazeki & Toki).

Distribution : Europe, North America, New Zealand and Asia (Japan, USSR).

Specimens examined.

Otoineppu, Hokkaido, on dead stem of broad-leaved tree, 7-IX-1969, K. A., Y. H. & H. F., (F-11294); Numanohara, Soounkyo, Hokkaido, on broad-leaved tree, 11-IX-1969, H. F. & Y. H., (F-11295); Eniwa, Hokkaido, 20-IX-1962, Y. H., (F-10739); Kiyosumi, Chiba pref., on broad-leaved tree, 24-X-1967, K. A., Y. H. & H. F., (F-11208, F-11291, F-11293); Asakawa, Tokyo, on *Abies firma*, 8-X-1962, H. F., (F-10046, F-10047), on *Pinus densiflora*, 10-VIII-1950, K. A., (F-10610), 15-XI-1950, K. A., (F-10611, F-10612), 6-X-1965, H. F. & S. Omori, (F-10741, F-10743),

on dead branch of *Pinus densiflora*, VIII-1957, K. A., (F-11289), on *Quercus*, 17-X-1963, Y. H., (F-11213), on coniferous tree, 15-IV-1964, H. F. & T. K., (F-11289), on *Pinus densiflora*, X-1969, H. F., (F-11289); Shimada, Shizuoka pref., 25-III-1950, K. A., (F-10613); Gotenba, Shizuoka pref., on coniferous tree, 10-XI-1961, K. A. & Y. H., (F-11290); Katsuura, Wakayama pref., on coniferous tree, III-1966, K. A., (F-11236); Kaimon, Kagoshima pref., on broad-leaved tree, 16-X-1966, H. F., (F-11215); Uchizume, Kagoshima pref., on broad-leaved tree, 18-X-1963, K. A. & H. F., (F-11217), on *Machilus*, VIII-1962, K. A., (F-11216, F-11218).

Note.

This species is usually found on dead stumps of coniferous trees in Japan, and is characterized in that it has cystidia of peculiar shape.

The ability to decompose the log materials is considerably high, and in Canada it has been reported by Davidson (1957) that it is an important fungus which causes "heart rot" in *Abies balsamea*.

9) ***Odontia subspathulata*** **Furukawa** sp. nov. (Fig. 10, Pl. 3, A, B)

Basidiocarpus resupinatum, effusum, tenuis, lenis, ceraceus, non rimosa, pallide ochraceus; Margo floccosus, pallide ochraceus; Spinae proteum, spathulum, irpicoideum, 1～1.5 mm longae, obtusatum, fibriata; Subiculum tenuis, pallide ochraceus, 100～120 μ altus; Subiculum hyphae subcrassitunicatus, paniculatus, fibuligerum, 3.5～5 μ diam.; Cystidia capitulate, 4～5×30～40 μ, alius cylindraceus, 4～5 μ diam.; Basidia clavata, 3.5～4×17～20 μ; Sporae ellipsoideus, laevis, hyalinus, 4～5×5～6 μ, non-amyloideus.

Macroscopic characters.

Basidiocarps resupinate, widely effused, thin, soft, ceraceous or subceraceous, not cracked, pale ochraceous buff to light ochraceous buff; Margin floccose, white to pale ochraceous buff; Spines variable in shape, spathulate to irpiciform, obtuse, fimbriate, 1～1.5 mm long; Subiculum thin, pale ochraceous buff, 100～120 μ thick.

Microscopic characters.

Subiculum hyphae loosely arranged, slightly thick-walled, surface smooth or sometimes incrusted, branched, with clamp connections, 3.5～5 μ wide; Cystidia of two types, abundant, both cystidia in the hymenial layer, the one capitulate, 4～5×30～40 μ, swollen part 5～7 μ diam., projecting up to 17 μ, the other cylindrical, incrusted, 4～5 μ wide; Basidia clavate, 3.5～4×17～20 μ, 4-spored; Basidiospores ellipsoid, smooth, hyaline, 4～5×5～6 μ, non-amyloid, with one guttulate.

Habitat : On dead branch and stem of conifers, associated with a white rot.

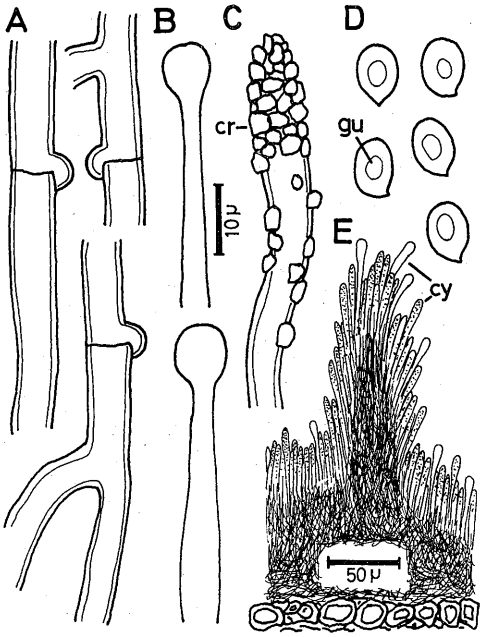

Fig. 10 Microscopic elements of *Odontia subspathulata* Furukawa (F-10732)
A : Subiculum hyphae B, C, cy : Cystidia
D : Basidiospores
E : Long section of spine
cr : Crystals on the surface of cystidia
gu : Guttulate

Japanese name : Nise-herabatake (Furukawa).

Distribution : Asia (Japan).

Specimens examined.

Aokigahara, Yamanashi perf., on coniferous wood, 30-X-1965, H. F., (F-10732 Type) ; Ebino, Kagoshima pref., on coniferous wood, 10-XI-1967, T. K., (F-11327).

Note.

This species is characterized in having two different shapes of cystidia as specified below. The one is capitulate, the other is cylindrical and incrusted. The naked portion at the tip of cabitulate cystidia dyes well in phloxine.

10) ***Odontia rimosissima*** **Peck** (Fig. 11, Pl. 3, C, D)

N. Y. State Mus. Rep., 50 : 114, 1897; Gilbertson, Mycologia, 54 : 667, 1962.

Macroscopic characters.

Basidiocarps annual, resupinate, effused, loosely adnate, membranaceous, cracked in dried specimen; Hymenial surface light ochraceous buff to cinnamon buff; Margin finely farinaceous; Spines crowded, often divided at the apex, 0.2～0.3 mm long; Subiculum soft, light ochraceous buff, 0.1～0.2 mm thick.

Microscopic characters.

Subiculum hyphae mostly thin-walled, frequently branched, slightly incrusted, with numerous clamp connections; Cystidia cylindrical, slightly incrusted, 4～5μ wide, 35～40μ long; Cystidioles abundant at the hymenium, staining dark red in phloxine, ventricose-rostrate or clavate, 4～5μ wide; Basidia subclavate, 4-spored, 3～4×12～15μ; Basidiospores ellipsoid to cylindrical-ellipsoid, smooth, hyaline, 3～4×4～6μ.

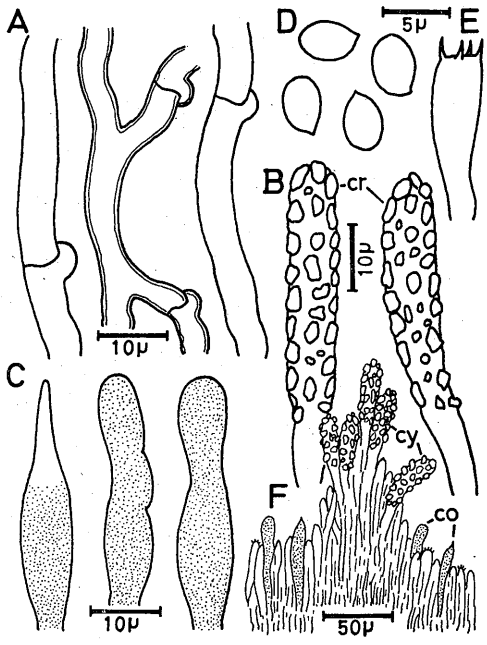

Fig. 11 Microscopic elements of *Odontia rimosissima* Peck (F-11197)
A : Subiculum hyphae　B, cy : Cystidia
C, co : Cystidioles　D : Basidiospores
E : Basidia　F : Long section of spine
cr : Crystals on the surface of cystidia

Habitat : On broad-leaved trees, associated with a white rot.

Japanese name : Sasakure-komebatake-modoki (Furukawa).

Distribution : North America and Asia (Japan).

Specimen examined.

Otoineppu, Hokkaido, on broad-leaved tree, 7-IX-1967, K. A., Y. H. & H. F. (F-11197).

Note.

This species is characterized in having ventricose-rostrate cystidioles, which can be dyed thickly in phloxine, and lightly incrusted apical cystidia.

11) ***Odontia alutacea*** (FRIES) BOURDOT et GALZIN (Fig. 12, 13, Pl. 3, E, F, 12, A)

Hym. Fr., 422, 1927; MILLER, Mycologia, 26 : 21, 1934; NIKOLAJEVA, Fl. Pl. Crypt. URSS 6(2) : 124, 1961; FURUKAWA & AOSHIMA, Trans. mycol. Soc. Japan, 7(2～3) : 194, 1966.

Synonym : *Hydnum alutaceum* FRIES, Syst. Myc., 1 : 417, 1821.

Hyphodontia alutacea (FR.) ERIKSSON, Symb. Bot. Upsal., 16(1) : 104, 1958.

Macroscopic characters.

Basidiocarps resupinate, widely effused, adnate, very thin, soft, loose and floccose, not cracked, cinnamon buff; Margin floccose; Spines scattered, sometimes crowded, conical, pointed or slightly fimbriate at the apex; Subiculum very thin, soft, cinnamon buff.

Microscopic characters.

Subiculum hyphae slightly thick-walled, frequently branched, with numerous clamp connection, 3.5～5μ wide; Tramal hyphae as in subiculum; Cystidia in terminal tufts at the apex of the spine and widely scattered along the sides, cylindrical, septate, with clamp connections, thin-walled, not incrusted, 4～5μ diam., 25～28μ long; Basidia clavate, 4-spored, 4～5×15～20μ; Basidiospores cylindrical, curved, smooth, hyaline, 2～2.5×6～8μ.

Cultural characters.

Growth characters : Growth very slow, forming in 10 days a mycelial mat 2 cm in diameter on malt agar medium, 1.5 cm in diameter on potato glucose agar medium, white, usually very thin, closely appressed, slightly fimbriate, colorless, even; Odorless.

Hyphal characters : Aerial hyphae thin-walled, 3～4μ wide, hyaline, with clamp connections, branched; Submerged hyphae branched, thin-walled, hyaline, with clamps; Chlamydo-

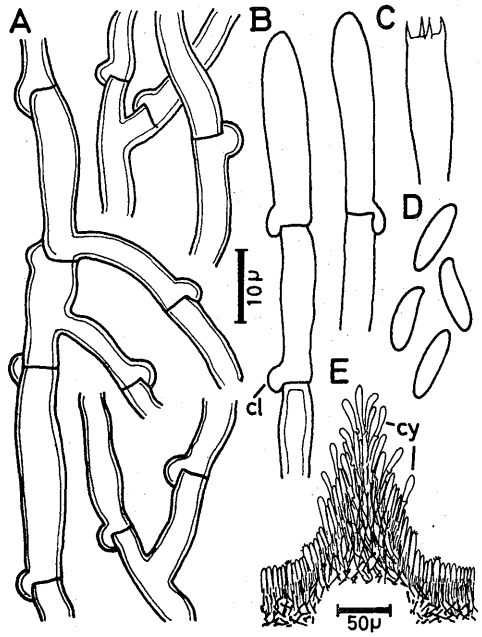

Fig. 12 Microscopic elements of *Odontia alutacea* (FR.) BOURD. et GALZ. (F-10605)
A : Subiculum hyphae B, cy : Cystidia
C : Basidia D : Basidiospores
E : Long section of spine

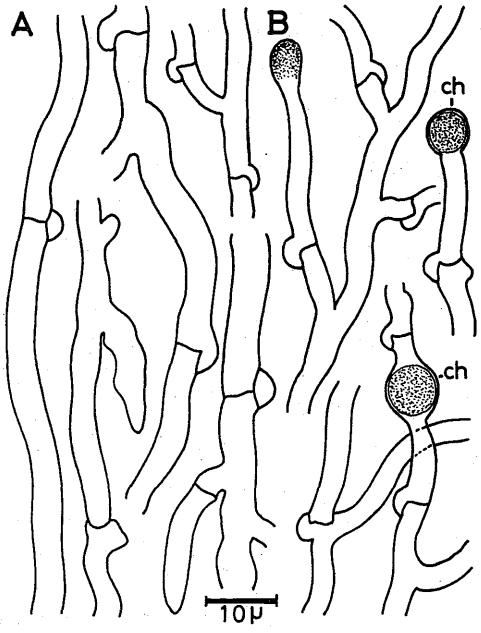

Fig. 13 Mycelial structure from a culture of *Odontia alutacea* (FR.) BOURD. et GALZ. (Od 21a)
A : Aerial hyphae B : Submerged hyphae
ch : Chlamydospores

spores usually abundant, globose, 5～8×5～7μ.

Temperature relations : Optimum approximately 20°C. Average diameters of mycelial mat in 10 days in the dark at constant temperatures follow : 2.1 cm, 20°C; 1.4 cm, 25°C; 1.0 cm, 30°C; trace, 35°C on malt agar medium, 1.5 cm, 20°C; 1.2 cm, 25°C; 0.9 cm, 30°C; trace, 35°C on potato glucose agar medium.

Habitat : On coniferous and deciduous trees, associated with a white rot.

Japanese name : Usucha-komebatake (Furukawa & Aoshima).

Distribution : Europe, North America and Asia (Japan).

Specimens examined.

Senzu, Shizuoka pref., on *Tsuga sieboldii*, IX-1949, K. A., (F-10605); Senzu, Shizuoka pref., on *Betula*, IX-1949, K. A., (F-10601); Kiyosumi, Chiba pref., on decayed broad-leaved, tree, 1-X-1961, K. A., Y. H. & H. F., (F-11209); Matsunoyama, Niigata pref., on *Quercus*, 13-IX-1964, K. A. & Y. H., (F-11350); Nobeyama, Nagano pref., on *Larix*, 25-VIII-1962, K. A., Y. H. & H. F., (F-11238); Kawakami, Misugi, Mie pref., on coniferous tree, 27-VII-1967, H. F., (F-11035 ♂ Od 21a, F-11054, F-11055); Hirai, Kozagawa, Wakayama pref., on decayed broad-leaved tree, 30-VIII-1967, H. F., (F-11351).

Note.

The floccose texture and long-cylindrical spores are very characteristic.

12) ***Odontia stipata*** (**Fires**) **Quélet** (Fig. 14, Pl. 3, G, H)

Fl. Myc. Fr., 435, 1888; Bourdot & Galzin, Hym. Fr., 424, 1927; Miller, Mycologia, 26 : 24, 1934; Nikolajeva, Fl. Pl. Crypt. URSS 6(2) : 116, 1961; Furukawa & Aoshima, Tran. mycol. Soc. Japan, 7(2～3) : 151, 1966.

Synonym : *Hydnum stipatum* Fries, Syst. Myc., 1 : 425, 1821, Hym. Eur., 617, 1874.

Macroscopic characters.

Basidiocarps resupinate, widely effused, thin, soft, floccose, loosely adnate, not cracked, white to light buff when fresh, pinkish cinnamon when dry; Margin irregular, white, tomentose, sterile; Spines crowded, slender, pointed, irregular in size, 1～2 mm long, 0.2～0.4 mm diam., 2～3 spines per 1 mm; Subiculum thin, soft, white to light buff, 0.1～0.2 mm thick.

Microscopic characters.

Subiculum hyphae distinct, loosely arranged, thin-walled and slightly thick-walled, frequently branched, with clamp connections, 3～5μ wide; Cystidia long claviform, projecting from the apex of spine, 3～4×20～25μ; Basidia clavate, 3～5×12～18μ, 4-spored; Basidiospores ovoid, smooth, hyaline, 3～4×5～6μ, non-amyloid, with one guttulate.

Habitat : On deciduous and coniferous trees, associated with a white rot.

Japanese name : Wata-komebatake (Furukawa & Aoshima).

Type locality : Europe.

Distribution : Europe, North America and Asia (Japan, USSR).

Specimens examined.

Meguro, Tokyo, on dead stem of broad-leaved tree, 25-X-1950, K. A., (F-10616); Nisecharo, Soounkyo, Hokkaido, on bark of dead broad-leaved tree, 11-IX-1969, Y. H. & H. F., (F-11339); Nobeyama, Nagano pref., on bark of larch, 11-XI-1961, K. A. & Y. H., (F-11340).

Note.

This species is characterized by its very soft, floccose fruit body, pointed spines and emerging tufts of cystidia.

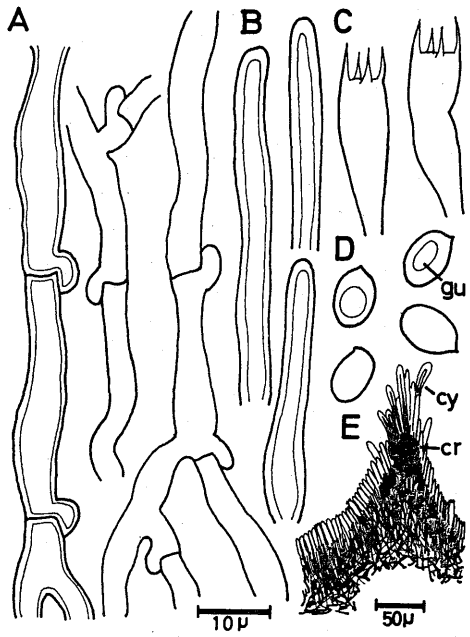

Fig. 14 Microscopic elements of *Odontia stipata* (Fr.) Quél. (F-10616)
A : Subiculum hyphae B, cy : Cystidia
C : Basidia D : Basidiospores
E : Long section of spine cr : Crystals
gu : Guttulate

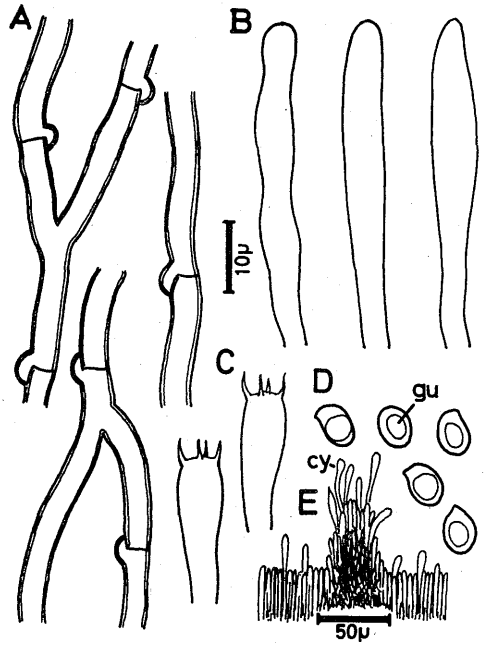

Fig. 15 Microscopic elements of *Odontia irregularis* Furukawa (F-11326)
A : Subiculum hyphae B, cy : Cystidia
C : Basidia D : Basidiospores
E : Long section of spine
gu : Guttulate

In Japan, this species is distributed in Hokkaido and in the northern parts of Honshu.

13) ***Odontia irregularis*** **Furukawa** sp. nov. (Fig. 15, Pl. 4, A, B)

Basidiocarpus resupinatum, late effusum, tenuis, lenis, tomentosus vel membranaceum, non rimosa, pallide luteum vel calidus luteum; Margo inaequalis, tomentosum vel floccosus, tenuis, pallide luteum; Spinae inaequalis, grandis vel brevis, conicus vel cylindraceus, obtusatus, 70～300μ diam., 70～100μ longae; Subiculum tenuis, lenis, pallide luteum, 7～100μ altus; Subiculum hyphae leptodermus, paniculatus, fibuligerum, 2.5～3μ diam.; Cystidia cylindraceus, leptodermus, 4～5×30～50μ; Basidia clavate, 4～5μ diam.; Sporae ellipsoideus, laevis, hyalinus, 4～5×5～6μ, non-amyloideus.

Macroscopic characters.

Basidiocarps resupinate, widely effused, thin, soft, tomentose or membranaceous, not separable from substratum, not cracked after drying, light buff to antimony yellow; Margin irregular, tomentose or floccose, thin, soft, white to light buff; Spines irregular in size, conical or short cylindrical, obtuse, 70～300μ diam., 70～100μ long; Subiculum thin, soft, light buff, 70～100μ thick.

Microscopic characters.

Subiculum hyphae distinct, loosely arranged, thin-walled, frequently branched, with clamp connections, not incrusted, 2.5～3μ wide; Cystidia numerous at hymenium and the apex of spine, cylindrical or long clavate, thin-walled, surface smooth, 4～5μ wide, 30～50μ long, pro-

jecting 12～20μ long; Basidia clavate, 4-spored, 4–5μ wide; Basidiospores ellipsoid, smooth, hyaline, 4～5×5～6μ, non-amyloid, with one guttulate.

Habitat : Growing on bark of dead broad-leaved tree, associated with a white rot.

Japanese name : Midare-komebatake (FURUKAWA).

Distribution : Asia (Japan).

Specimen examined.

Numanohara, Soounkyo, Hokkaido, on bark of broad-leaved tree, 11-IX-1969, Y. H. & H. F., (F-11326 Type, F-11325).

Note.

This species is characterized in that its fruit bodies are tomentose, spines are irregular in size, and the cystidia are of cylindrical shape, projecting in large number from the apex of spine and hymenium.

The color of fruit body resembles that of *O. ochraceum* FURUKAWA, differing entirely in its microscopical characters.

The shape of irregularly-sized spines of this species, which constitutes the biggest external feature, reminds us of the genus *Grandinia*, but microscopical characters reveal that it definitely belongs to the genus *Odontia*.

14) ***Odontia verruca*** **FURUKAWA** sp. nov. (Fig. 16, Pl. 4, C, D)

Basidiocarpus annuum, resupinatum, late effusum, tenuis, lenis, tomentosus, non rimosa, pallide ochraceus luteum; Margo tenuis, floccosus; Spinae coactus, verruca, conicus, obtusatus, 150～200μ diam., 250～300μ longae; Subiculum tenuis, 250～350μ altus; Subiculum hyphae leptodermus, paniculatus, fibuligerum, 2.5～3.5μ diam.; Cystidia capitulatus, admodum angustus, 17～20μ longae; Basidia clavata, 3.5～4×12.5μ; Sporae allantoideus, laevis, hyalinus, 1.2～2×5～6μ.

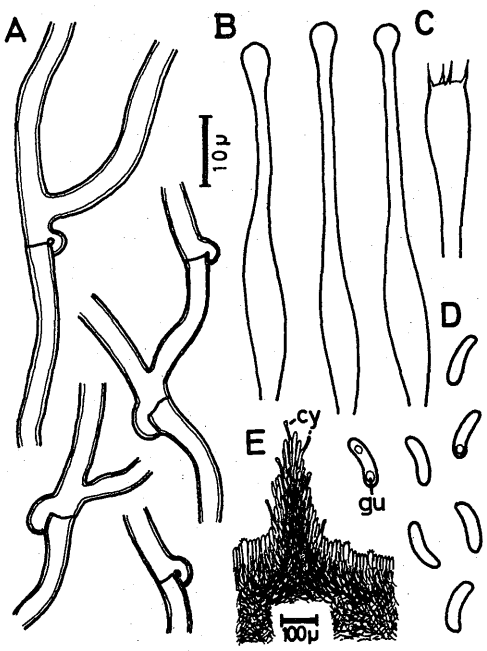

Fig. 16 Microscopic elements of *Odontia verruca* FURUKAWA (F-11268)
A : Subiculum hyphae B, cy : Cystidia
C : Basidia D : Basidiospores
E : Long section of spine
gu : Guttulate

Macroscopic characters.

Basidiocarps annual, resupinate, widely effused, not easily separated, thin, soft, tomentose, pruinose, not cracked, pale ochraceous buff to light ochraceous buff; Margin thin, soft, floccose, white; Spines crowded, warty, conical, obtuse, smooth or slightly fimbriate at the apex, 250～300μ long, 150～200μ diam.; Subiculum thin, soft, white or pale ochraceous buff, 250～350μ thick.

Microscopic characters.

Subiculum hyphae distinct, loosely arranged, thin-walled, sometimes branched, with clamp connections, 2.5～3.5μ wide; Tramal hyphae as in subiculum; Cystidia numerous at the spine, thin-walled, capitulate or tibiiform, very narrow, 17～20μ long,

basal part 2.5μ wide, apical part 1μ wide, 2.5μ wide in the globose part of the apex, projecting 8～15μ long; Basidia clavate, 3.5～4×12.5μ, with sterigmata 3.5μ long, 4-spored; Basidiospores allantoid, smooth, hyaline, 1.2～2×5～6μ, non-amyloid, sometimes 1～2 guttulate.

Habitat : Growing on barks, branches and stems of dead coniferous trees, associated with a white rot.

Japanese name : Ibo-komebatake (FURUKAWA).

Distribution : Asia (Japan).

Specimens examined.

Asakawa, Tokyo, on bark and stem of dead *Pinus*, 25-X-1965, K. A., (F-11268 Type); Shiratori, Ebino, Miyazaki pref., on stem of dead coniferous tree, 9-XI-1967, T. K., (F-11269).

Note.

This species is characterized in that its hymenium is warty and of powder-like appearance and that its cystidia is so narrowly capitulate that it is liable to be overlooked unless examined under a high-power microscope.

The species which have the cystidia of capitulate or ventricose type includes *O. ochraceum* FURUKAWA, *O. subspathulata* FURUKAWA, *O. aspera* (FR.) BOURD. et GALZ., *O. pelliculae* FURUKAWA etc. *O. ochraceum* differs entirely from this species in the shape and size of the spore. Other three species are clearly distinguished from this species in having cystidia of different types.

15) ***Odontia rufobrunneus* FURUKAWA** sp. nov. (Fig. 17 a, b, Pl. 4, E, F)

Basidiocarpus resupinatum, effusum, membranaceum, non rimosa, pallide ochraceum; Margo tenuis, cremea; Spinae subriformis, clavata, cylindraceus vel spathulus, rufobrunneus, 1～1.5 mm longae; Subiculum tenuis; Subiculum hyphae subcrassitunicatus, paniculatus, 5～7.5μ diam.; Tramal hyphae leptodermus, paniculatus, fibulis desutitutum, 3～4μ diam.; Cystidia clavata, 5μ diam.; Sporae ellipsoideus, laevis, hyalinus, 2.5×4～5μ.

Macroscopic characters.

Basidiocarps resupinate, orbicular at first, then coalescent, widely effused, membraneous, tough, not cracked; Hymenial surface light ochraceous buff to ochraceous orange, becoming alutaceous, with reddish brown spines; Margin thin, cream to light ochraceous buff, adnate; Spines crowded, subulate, clavate, cylindrical and spathulate, apices blunt, often adhering in small groups of 5～10, sometimes imbricate, 1～1.5 mm long; Subiculum thin, soft, white, 0.3～0.5 mm thick.

Microscopic characters.

Subiculum hyphae loosely arranged, faintly thick-walled, frequently branched, without clamp connections, 5～7.5μ wide; Tramal hyphae almost thin-walled, sometimes branched, without clamp connections, 3～4μ wide; Cystidia cylindrical, elongated, thin-walled, arising from the axial portion of the spine, 5μ wide, 60～80μ long; Hymenial cystidia also present; Basidia clavate, 5μ wide, 2～4 spored; Basidiospores ellipsoid, laterally apiculate, smooth, hyaline, 2.5×4～5μ.

Habitat : Growing on bark of branches and stems of broad-leaved trees, associated with a white rot.

Japanese name : Aka-komebatake (FURUKAWA).

Distribution : Asia (Japan).

Specimens examined.

Meguro, Tokyo, on *Quercus* (bed logs of Shiitake mushroom), 9-IX-1968, H. F., (F-11329

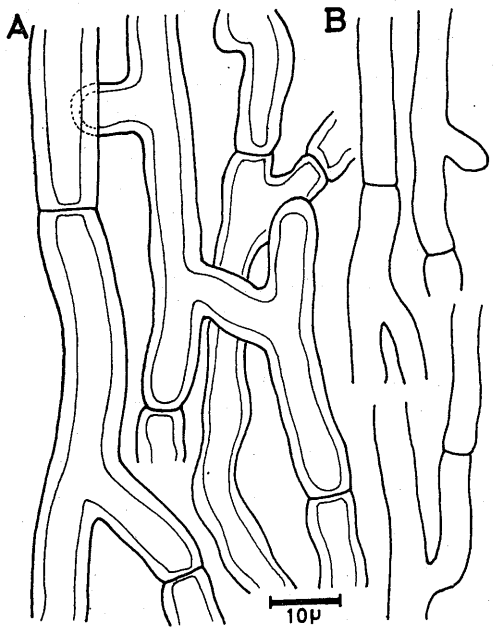

Fig. 17-a Microscopic elements of *Odontia rufobrunneus* FURUKAWA (F-11392)
A : Subiculum hyphae
B : Tramal hyphae

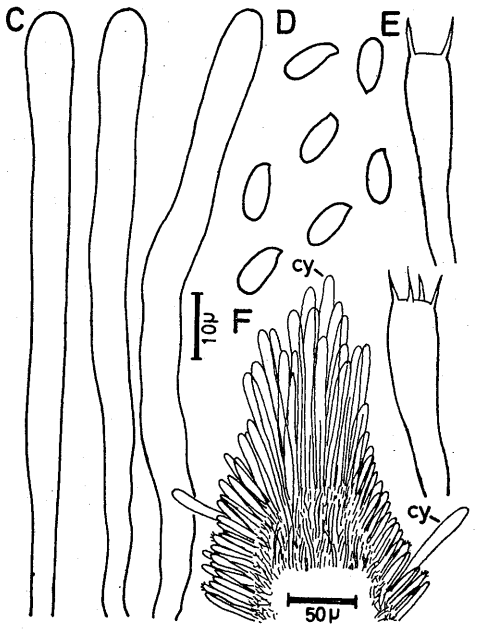

Fig. 17-b Microscopic elements of *Odontia rufobrunneus* FURUKAWA (F-11392)
C, cy : Cystidia　D : Basidiospores
E : Basidia　F : Long section of spine

Type, F-11393, F-11394, F-11395) ; Tomiyasu, Tottori pref., IX-1968, M. KOMATSU (F-11396).

Note.

The macroscopical characters of this species lie in comparatively thick (0.3～0.4 mm), long (1.5 mm), reddish brown color of spines, and microscopical characters comprise slightly thick-walled subiculum hyphae, with abundant branchings but no clamp connections and numerous cylindrical cystidia.

At first white and floccose colonies are formed in the cracks of the bark of trees in speckled form, later adjoining colonies are connected together, and the color changes into creamy to reddish brown, and finally effuses widely over the bark.

This species usually grows on the bed logs of Shiitake mushroom and decomposes the logs fairly severely causing a white rot. Hence, this is one of the species harmful to the bed log of Shiitake mushroom.

16) ***Odontia subalutacea*** **FURUKAWA** sp. nov. (Fig. 18, Pl. 4, G, H)

Basidiocarpus resupinatum, late effusum, adnatum, membranaceum, non rimosa, pallide ochraceum; Spinae conicum; Subiculum tenuis, lenis, cremea vel ochraceum luteum; Subiculum hyphae leptodermus, nodose-septate vel paniculatus, 3.5～5μ diam.; Cystidia cylindraceus vel clavatum, leptodermus, nodose-septate, 4～5μ diam., 50～65μ longae; Basidia clavata, 4～5μ diam.; Sporae ellipsoideus vel obovatum, laevis, hyalinus, 3～3.5×5～6μ.

Macroscopic characters.

Basidiocarps resupinate, widely effused, adnate, not separable, thin membraneous, not cracked in dried specimen, light ochraceous buff to pinkish buff; Margin similar at hymenial

surface in color; Spines crowded, very small, conical, pointed or slightly fimbriate; Subiculum thin, soft, cream or ochraceous buff, 0.1 mm thick.

Microscopic characters.

Subiculum hyphae distinct, loosely arranged, thin-walled and slightly thick-walled, with clamp connections and numerous branchings; Hymenial layer 30～35μ thick; Cystidia at apices of spines, cylindrical or clavate, thin-walled, septate, with clamp connections, not incrusted, 4～5μ wide, 50～65μ long; Basidia clavate, 4～5μ wide, 4-spored; Basidiospores ellipsoid or obovate, smooth, hyaline, 3～3.5×5～6μ, occasionally 1～2 guttulate.

Habitat : On dead branches and stems of broad-leaved trees, associated with a white rot.

Japanese name : Chirimen-komebatake (Furukawa).

Distribution : Asia (Japan).

Specimen examined.

Kirizumi, Sakamoto, Gumma pref., on broad-leaved tree, 2-X-1968, H. F., (F-11360 Type).

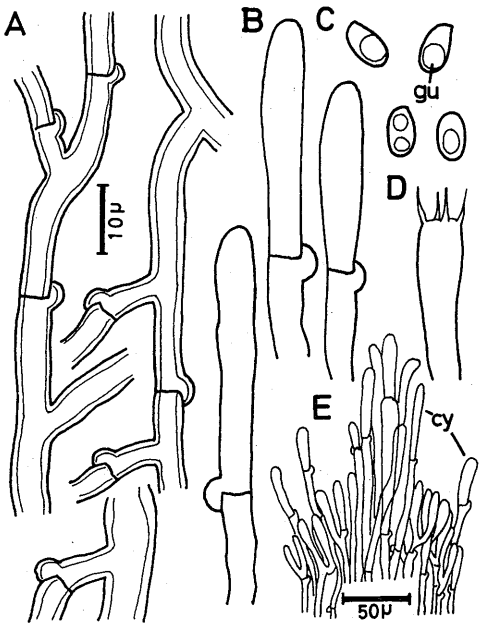

Fig. 18 Microscopic elements of *Odontia subalutacea* Furukawa (F-11360)
A : Subiculum hyphae B, cy : Cystidia
C : Basidiospores D : Basidia
E : Long section of spine
gu : Guttulate

Note.

O. alutacea (Fr.) Bourd. et Galz. is somewhat similar to this new species; the subiculum hyphae of *O. alutacea*, however, are very loosely arranged and spores are curved and cylindrical.

17) ***Odontia papillosa*** (**Fries**) **Bresadola** (Fig. 19, Pl. 5, A, B)

Fungi Kmet., No. 116 et Fungi Polon., 86, 1903; Bourdot et Galzin, Hym. Fr., 430, fig. 116, 1927; Pilát, Bull. Soc. Myc. Fr., 49 : 299, 1933; Christiansen, Friesia, 4 : 321, fig. 6, 1952～1953; Nikolajeva, Fl. Pl. Crypt. URSS 6(2) : 123, fig. 71, 72, 1961.

Synonym : *Thelephora papillosa* Fries, Elench. Fung., 212, 1828.

Grandinia papillosa (Fr.) Fries, Epic., 528, 1836～1838, Hym. Eur., 626, 1874; Karsten, Myc. Fenn., 301, 1874; Saccardo, Syll. Fung., 6 : 502, 1888.

Hyphodontia papillosa (Fr.) Eriksson, Symb. Bot. Upsal., 16 : 104, 1958; Christiansen, Dansk Bot. Arkiv, 19(2) : 226, 1960.

Macroscopic characters.

Basidiocarps resupinate, widely effused, loosely adnate, membranaceous, slightly cracked, white to pale ochraceous buff or cartridge buff; Margin white to cream, floccose or pruinose; Spines crowded, conical, very short and with strongly divided tips; Subiculum thin, soft.

Microscopic characters.

Subiculum hyphae loosely arranged, thin-walled or slightly thick-walled, frequently branched, with numerous clamp connections, 3.5～5μ wide; Cystidia slightly capitate, thin-walled,

3.5～5×30～40μ, projecting 15～20μ long; Basidia cylindrical to clavate, 9～11×3～4μ, with 2～4 sterigmata; Basidiospores short cylindrical to oblong, smooth, hyaline, 2.5×5μ, with one guttulate.

Habitat : Growing on dead woods of both deciduous and coniferous trees, associated with a white rot.

Japanese name : Konakaburi-komebatake (Furukawa).

Distribution : Europe, North America and Asia (Japan, USSR).

Specimen examined.

Chichibu, Saitama pref., on broad-leaved tree, 11-XI-1969, K. A., Y. H. & T. K., (F-11195).

Note.

Spines of this species are extremely small and resemble those of *O. bicolor* (Alb. et Schw. ex Fr.) Bres.. But this species can be distinguished by microscopic characters.

18) ***Odontia transiens*** **Bresadola** (Fig. 20, Pl. 5, C, D)

Torreya, 72, 1913; Bourdot et Galzin, Hym. Fr., 435, 1927; Nikolajeva, Fl. Pl. Crypt. URSS 6(2) : 127, 1961.

Macroscopic characters.

Basidiocarps resupinate, widely effused, thin, coriaceous, membranaceous, not easily separated, fragile in dried specimen, white, capucine buff to light ochraceous buff; Margin thin, sterile, tomentose, capucine buff; Spines small, not crowded, ochraceous salmon, conical to subulate, obtuse, sometimes fimbriate at the apex, 0.3～0.5 mm long, 0.2～0.3 mm diam., 2～3

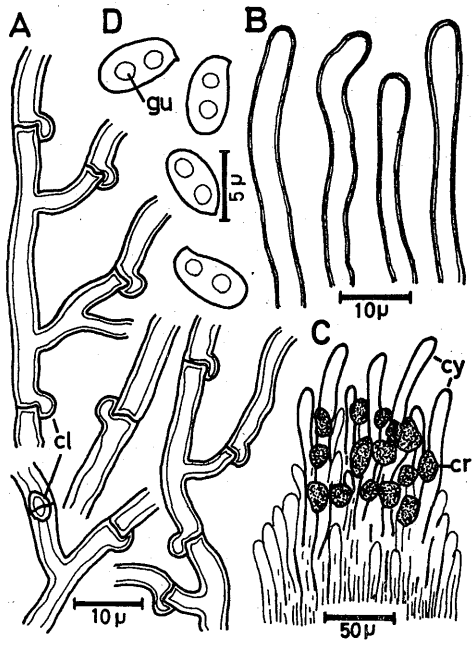

Fig. 19 Microscopic elements of *Odontia papillosa* (Fr.) Bres. (F-11195)
A : Subiculum hyphae B, cy : Cystidia
C : Long section of spine
D : Basidiospores cr : Crystals
cl : Clamp connections gu : Guttulate

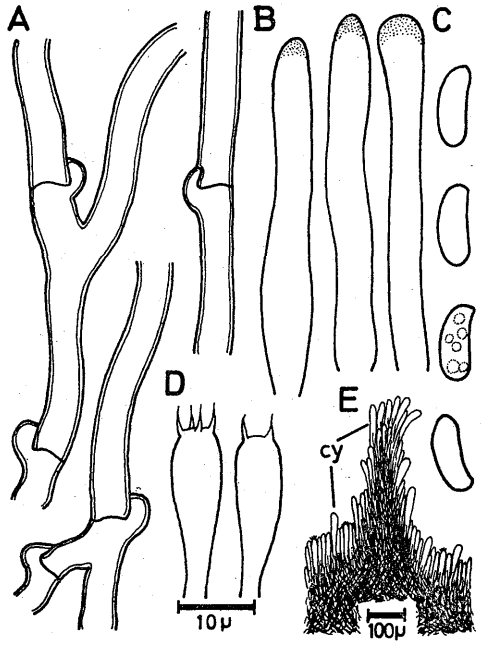

Fig. 20 Microscopic elements of *Odontia transiens* Bres. (F-11266)
A : Subiculum hyphae B, cy : Cystidia
C : Basidiospores D : Basidia
E : Long section of spine

spines per 1 mm; Subiculum soft, tomentose, white to cream, 0.4～0.8 mm thick.

Microscopic characters.

Subiculum hyphae loosely arranged, thin-walled, frequently branched, with clamp connections, 2.5～4 μ wide; Tramal hyphae as in subiculum; Cystidia cylindrical, sometimes slightly swollen, incrusted at the apical parts, 4～6 μ diam.; Basidia clavate, 5×17～20 μ, 2～4 spored; Basidiospores reniform, smooth, hyaline, 4×10～11 μ, with 2～3 guttulate.

Habitat : Growing on bark of dead deciduous trees, associated with a white rot.

Japanese name : Kanba-no-komebatake (Furukawa).

Distribution : Europe and Asia (Japan, USSR).

Specimen examined.

Otoineppu, Hokkaido, on bark of dead *Betula* sp. 7-IX-1969, K. A., Y. H. & H. F., (F-11266).

Note.

O. transiens Bres. is known for its extremely long spores.

In Japan, this species was collected only once in Hokkaido.

19) ***Odontia ochraceum*** **Furukawa** sp. nov. (Fig. 21, Pl. 5, E, F)

Basidiocarpus resupinatum, late effusum, tenuis, lenis, membranaceum, pallide ochraceum; Margo tomentosus; Spinae subuliformis vel cylindraceus, 0.1 mm longae; Subiculum tenuis, 0.1 mm altus; Subiculum hyphae subcrassitunicatus, paniculatus, fibrigerum, 3.5～5 μ diam.; Cystidia obclavatum, 4～5×25～30 μ; Sporae ellipsoideus, laevis, hyalinus, 3～4×5～6 μ.

Macroscopic characters.

Basidiocarps resupinate, widely effused, thin, soft, membranaceous, not cracked, easily separable from the substratum, pale ochraceous buff to ochraceous buff; Margin tomentose or floccose, thin, pale ochraceous buff; Spines subulate to short cylindrical, obtuse, usually with the crests at the apical portions, 0.1 mm long, 10～13 spines per 1 mm; Subiculum very thin, same color as the hymenial surface, 0.1 mm thick.

Microscopic characters.

Subiculum hyphae distinct, loosely arranged, slightly thick-walled, frequently branched, with numerous clamp connections, 5 μ wide; Hymenial layer 15～25 μ thick; Cystidia abundant, tibiliform, slightly incrusted at the apices, 25～30 μ long, swollen at the axial portin, 2.5～3 μ diam., basal part 4～5 μ diam., projecting 7～12 μ from the hymenial surface; Basidia clavate, 4 μ wide, 2～4 spored; Basidiospores ellipsoid, faintly depressed on one side, smooth, hyaline, 3～4×5～6 μ, sometimes one guttulate.

Habitat : On dead branches and stems of broad-leaved and coniferous trees, associated with a white rot.

Japanese name : Nikuiro-komebatake (Furukawa).

Distribution : Asia (Japan).

Specimens examined.

Kaimon, Kagoshima pref., on broad-leaved tree, 16-X-1966, H. F., (F-11355 Type); Kawakami, Mie pref., on broad-leaved tree, 27-VII-1967, H. F., (F-11357, F-11358); Asakawa, Tokyo, on coniferous, 17-X-1963, H. F., (F-11356).

Note.

Species with cystidia whose shape is either obclavate or capitulate are *O. arguta* (Fr.) Quél. and *O. burtii* (Peck) Gilbertson. But, both species are entirely different from this species in having lanceolate cystidia additionally.

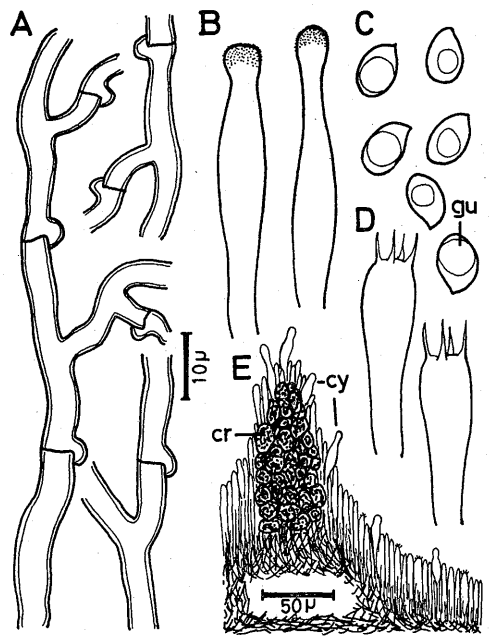

Fig. 21 Microscopic elements of *Odontia ochraceum* FURUKAWA (F-11355)
A : Subiculum hyphae B, cy : Cystidia
C : Basidiospores D : Basidia
E : Long section of spine
cr : Crystals gu : Guttulate

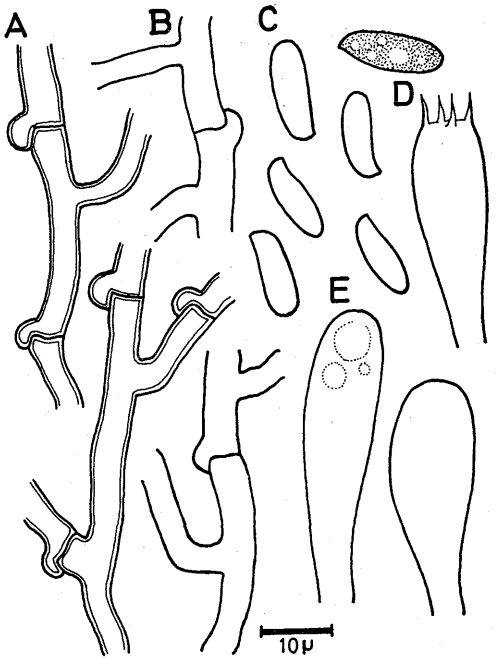

Fig. 22 Microscopic elements of *Odontia longospora* FURUKAWA (F-10765)
A : Subiculum hyphae
B : Tramal hyphae C : Basidiospores
D : Basidia E : Cystidia

20) ***Odontia longospora*** **FURUKAWA** sp. nov. (Fig. 22, Pl. 5, G, H)

Basidiocarpus resupinatum, late effusum, tenuis, lenis, membranaceum, rimosa, pallide ochraceum, salmonis; Spinae conicum vel cylindraceus, obutusatus, 0.2～0.3 mm longae; Margo floccosus, pallide ochraceum salmonis; Subiculum tenuis, 0.1 mm altus, subochraceus salmonis; Subiculum hyphae leptodermus, fibuligerus, paniculatus, 3～3.5μ diam.; Cystidia cylindraceus, non crustatum, 8.5～10×20～25μ; Basidia blavata, 7.5×15μ; Sporae oblongatum-ellipsoideus vel fusiformis-ellipsoideus, laevis, hyalinus, 3.5～5×12～15μ, non-amyloideus.

Macroscopic characters.

Basidiocarps resupinate, widely effused, thin, soft, membranaceous, often cracked in dried specimen, pale ochraceous salmon to light ochraceous salmon; Margin floccose, sterile, pale ochraceous salmon; Spines very small, not crowded, conical or short cylindrical, obtuse, 0.2～0.3 mm long, 3～4 spines per 1 mm; Subiculum pale ochraceous salmon, 0.1 mm thick.

Microscopic characters.

Subiculum hyphae compactly arranged, thin-walled, with clamp connections, frequently branched, 3～3.5μ; Cystidia numerous at hymenial layer, clavate, 8.5～10×20～25μ; Basidia clavate, 7.5×15μ, 4-spored; Basidiospores oblong-elliptical to fusiform-elliptical, smooth, hyaline, 3.5～5×12～15μ, non-amyloid.

Habitat : On bark of dead broad-leaved tree, associated with a white rot.

Japanese name : Usukawa-komebatake (FURUKAWA).

Distribution : Asia (Japan).

Specimen examined.

Minamiizu, Sizuoka pref., on broad-leaved tree, 24-III-1966, H. F., (F-10765 Type).

Note.

This species is characterized in having largest spores among the species of the genus.

21) ***Odontia sudans*** (ALBERTINI et SCHWEINITZ ex FRIES) BRESADOLA (Fig. 23, Pl. 6, A, B)

Accad. Sci. Lett. Rovereto III, 3 : 1000, 1897; PILÁT, Bull. Soc. Myc. Fr., 42 : 105, 1926 : BOURDOT & GALZIN, Hym. Fr., 424, 1927; MILLER, Mycologia, 26 : 22, 1934; CHRISTIANSEN, Friesia, 4(4～5) : 317, 1952～1953; NIKOLAJEVA, Fl. Pl. Crypt. URSS 6(2) : 104, 1961.

Synonym : *Hydnum sudans* ALB. et SCHW. ex FR., Syst. Myc., 1 : 425, 1821.

Theobolus sudans ALB. et SCHW. ex FR., Elench. Fung., 2 : 51, 1828.

Dacryobolus sudans (ALB. et SCHW. ex FR.) FR., Summa veg Scandinaviae, 2 : 404, 1849; ERIKSSON, Symb. Bot. Upsal., 16(1) : 115, 1958; CHRISTIANSEN, Dansk Bot. Arkiv, 19(2) : 248, 1960.

Grandinia sudans (ALB. et SCHW. ex FR.) LLOYD, Myc. Writ., 5, Hot., 52 : 741, 1917.

Macroscopic characters.

Basidiocarps effused, membranaceous-ceraceous, white to cinnamon buff; Margin byssoid or pruinose, white to cinnamon buff; Spines scattered, conical or short cylindrical, terminated by a viscid drop, 0.2～0.3 mm diam., 0.4～0.5 mm long; Subiculum cinnamon buff, 0.2 mm thick.

Microscopic characters.

Subiculum hyphae mostly thin-walled, fairly solid, with clamp connections, frequently branched; Cystidia cylindrical, septate, aggulutinated, projecting from the apex of the spine; Basidia cylindrical-clavate, with 4 sterigmate; Basidiospores cylindrical, curved, smooth, hyaline, 6～8×1～1.5μ.

Habitat : On dead wood of both deciduous and coniferous trees, associated with a white rot.

Japanese name : Nikawa-komebatake (FURUKAWA).

Distribution : Europe, North America and Asia (Japan, USSR).

Specimen examined.

Otoineppu, Hokkaido, on deciduous tree, 7-IX-1969, K. A., Y. H. & H. F., (F-11196).

Note.

The viscid bundles of cystidia are usually very conspicuous under a lens, well distinguishing itself by its peculiar spines.

FRIES established the genus *Dacryobolus* FR. in 1949, based on this species, which was accepted later by CHRISTIANSEN (1952～1953). Different from other species of *Odontia*, this

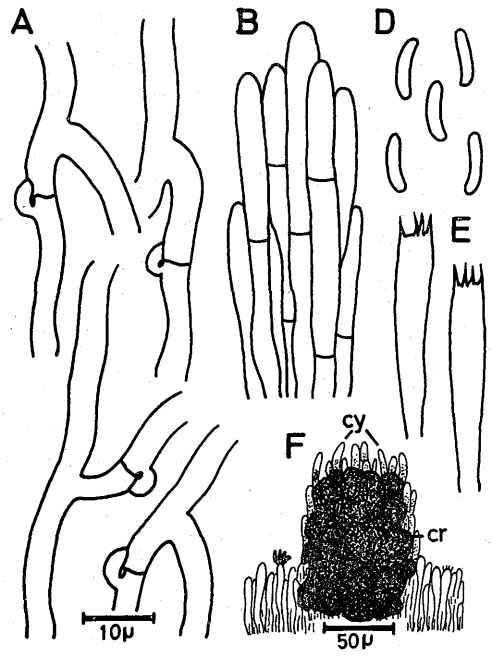

Fig. 23 Microscopic elements of *Odontia sudans* (ALB. et SCHW. ex FR.) BRES. (F-11196)
A : Subiculum hyphae B, cy : Cystidia
D : Basidiospores E : Basidia
F : Long section of spine cr : Crystals

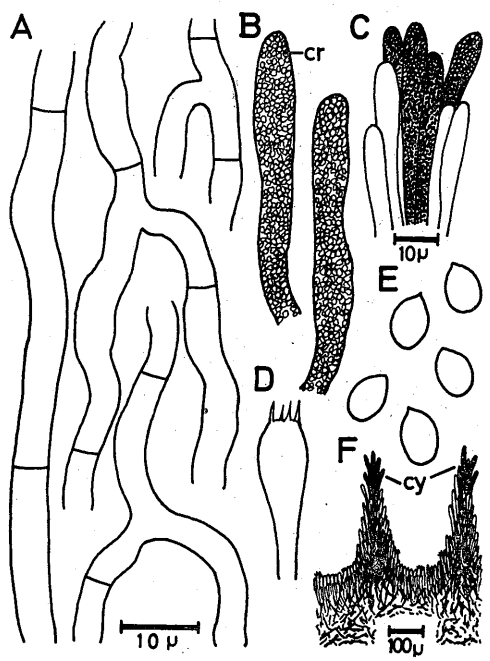

Fig. 24 Microscopic elements of *Odontia livida* Bres. (F-10615)
A : Subiculum hyphae B, C, cy : Cystidia
D : Basidia E : Basidiospores
F : Long section of spine
cr : Crystals on the surface of cystidia

species has an extremely peculiar characteristic in which lumps of resinous secretion exist at the apical part of the spines.

22) ***Odontia livida*** **Bresadola** (Fig. 24, Pl. 6, C, D)

Nuovo Giorn. Bot. Ital., 23 : 158, 1891 ; Miller, Mycologia, 26 : 29, 1934; Aoshima & Furukawa, Trans. mycol. Soc. Japan, 7(2～3) : 146, 1966.

Macroscopic characters.

Basidiocarps resupinate, widely effused, hard, very thin, ceraceous-crustaceous, many cracked, honey yellow to clay color; Margin irregular, indistinct, fimbriate, white; Spines conical or short cylindrical, very minute, rigid, hispid at the apex, 0.1～0.2 mm long, 50～60μ diam., 6～8 spines per 1 mm; Subiculum very hard, wax to coriaceous, honey yellow, 0.2～0.3 mm thick.

Microscopic characters.

Subiculum hyphae compactly arranged, thin-walled, without clamp connections, frequently branched, 2.5～5μ wide; Cystidia cylindrical, elongated, usually heavily incrusted, 3～5μ wide, 5～6 fascicled, projecting 25～30μ at the apices of the spines; Basidia clavate, 5～7×15～30μ, 4-spored; Basidiospores ellipsoid, smooth, hyaline, 4～5×4～5μ.

Habitat : Growing on dead wood of broad-leaved trees, associated with a white rot.

Japanese name : Ke-komebatake (Aoshima & Furukawa).

Distribution : North America and Asia (Japan).

Specimens examined.

Ooshika, Shimoina, Nagano pref., on deciduous tree, X-1948, K. A., (F-10615); Tomakomai, Hokkaido, on broad-leaved tree, 21-IX-1961, Y. H., (F-11342); Chichibu, Saitama pref., on broad-leaved tree, 11-XI-1969, K. A., Y. H. & T. K., (F-11343); Kawakami, Mie pref., on broad-leaved tree, 27-VII-1967, H. F., (F-11344); Hirai, Kozagawa, Wakayama pref., on broad-leaved tree, 30-VII-1967, H. F., (F-11345).

Note.

The honey-yellow, rigid and hispid spines, and the large spores are characteristic for this species. Common in Japan.

23) ***Odontia crustula*** **Miller** (Fig. 25, 26, Pl. 6, E, F, 12, B)

Mycologia, 26 : 29. 1934; Gilbertson, Pap. Michigan Aca. Sci. Art. Let., 49 : 20, 1964; Aoshima & Furukawa, Trans. mycol. Soc. Japan, 7(2～3) : 146, 1966.

Macorscopic characters.

Basidiocarps annual, resupinate, widely effused, thin, crustaceous-ceraceous, adnate, slightly

cracked, cartridge buff to cream buff; Margin irregular, indistinct, pruinose, narrowly floccose, sometimes slightly fimbriate, soft, white to cartridge buff; Spines crowded, minute, conical to short cylindrical, very obtuse, usually with the crests, 0.2～0.3 mm long. 0.1 mm diam., 6～7 spines per 1 mm; Subiculum thin, soft, cartridge buff, 0.7～0.8 mm thick.

Microscopic characters.

Subiculum hyphae closely arranged, thin-walled, frequently branched, with clamp connections, 2.5～5μ wide; Cystidia numerous at the apex of the spine, cylindrical, heavily incrusted, 4～6μ wide, projecting 15～100μ; Basidia clavate, 4.5～7×15～25μ, 4-spored; Basidiospores ellipsoid, smooth, hyaline, 3～4×4～6μ, sometimes one guttulate.

Cultural characters.

Growth characters : Growth medium, forming a mat 4 to 5 cm in diameter in 10 days on malt agar medium, 5 to 6 cm to diameter in 10 days on potato glucose agar medium; white, usually thin, plumose, with mycelium appressed to agar surface; Margin usually thin, fimbriate; Odorless.

Hyphal characters : Aerial hyphae thin-walled, walls surface smooth or incrusted, with clamps, sometimes branched, hyaline, 4～5μ wide; Submerged hyphae very narrow, thin-walled, walls surface smooth, with clamps. frequently branched, hyaline, 2～3μ wide.

Temperature relations : Optimum 25°C. Average mycelial mat diameters in 10 days in dark at constant temperatures follow : 4.2 cm, 20°C; 4.5 cm, 25°C, 4.3 cm, 30°C; 0 to trace,

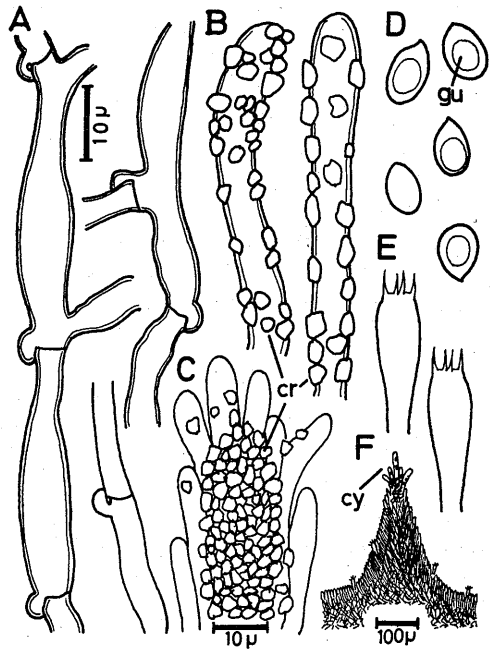

Fig. 25 Microscopic elements of *Odontia crustula* Miller (F-10614)
A : Subiculum hyphae B, C, cy : Cystidia
D : Basidiospores E : Basidia
F : Long section of spine
cr : Crystals on the surface of cystidia
gu : Guttulate

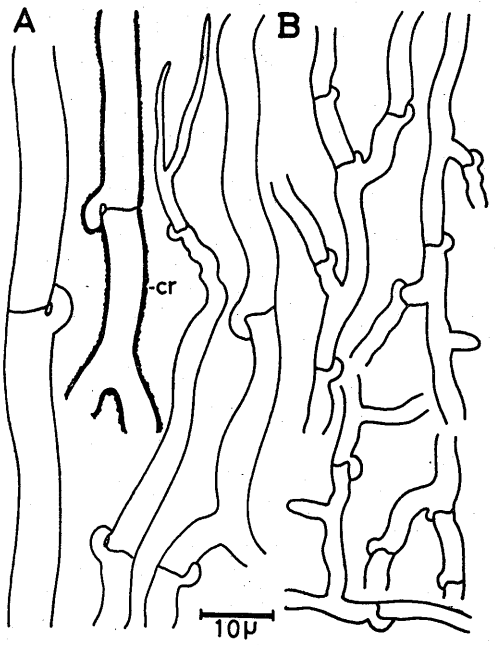

Fig. 26 Mycelial structure from a culture of *Odontia crustula* Miller (Od 16a)
A : Aerial hyphae B : Submerged hyphae
cr : Crystals on the surface of mycelia

35°C on malt agar medium, 4.2 cm, 20°C; 5.4 cm, 25°C; 4.1 cm, 30°C; 0 to trace, 35°C on potato glucose agar medium.

Habitat : On dead wood of deciduous and coniferous trees, associated with a white rot.

Japanese name : Sasakure-komebatake (Aoshima & Furukawa).

Distribution : North America and Asia (Japan).

Specimens examined.

Senzu, Shizuoka pref., on *Betula ermani* (decayed), 25-VII-1954, K. A., (F-10614); Nisecharo, Soounkyo, Hokkaido, on coniferous tree, Y. H. & H. F., (F-11297); Asahikawa, Hokkaido, on deciduous tree, 10-IX-1969, H. F., (F-11298); Kiyosumi, Chiba pref., on bark of dead coniferous tree, 1-X-1961, K. A., (F-11299), on *Quercus*, 24-X-1967, K. A., Y. H. & H. F., (F-11300); Chichibu, Saitama pref., on broad-leaved tree, 11-XI-1969, K. A., Y. H. & T. K., (F-11301, F-11302, F-11303, F-11304); Kirizumi, Sakamoto, Gumma pref., 2-X-1968, Y. H. & H. F., (F-11305, F-11306, F-11307); Hikawa, Nishitama, Tokyo, on *Quercus*, 26-V-1962, H. F., (F-11308); Asakawa, Tokyo, on *Chamaecyparis obtusa*, 6-X-1965, H. F., (F-10748), on *Quercus*, 6-X-1965, H. F., (F-11309), on *Chamaecyparis obtusa*, 26-VI-1964, K. A., (F-11310); Nobeyama, Nagano pref., on Larch, 15-IX-1961, K. A., (F-11207); Ooshika, Nagano pref., on broad-leaved tree, X-1956, K. A., (F-11311); Sugadaira, Nagano pref., on *Quercus*, 27-VII-1967, Y. H., (F-11311, F-11314); Hirai, Kozagawa, Wakayama pref., on broad-leaved tree, 30-VII-1967, H. F., (F-11315); Ebino, Miyazaki pref., on coniferous tree, 9-XI-1967, T. K., (F-11316); Hetsuka, Uchinoura, Kagoshima pref., on *Quercus* sp., 15-X-1963, K. A. & H. F., (F-11317); Sata, Kagoshima pref., on broad-leaved tree, 18-X-1966, H. F., (F-11318); Kaimon, Kagoshima pref., 16-X-1966, H. F., (F-10988 ♂ Od 16a, F-11319, F-11320).

Note.

O. crustosa (Fr.) Quél., which externally resembles this species, has slightly larger spores and subulate hymenial cystidia.

24) ***Odontia lanceolatum*** **Furukawa** sp. nov. (Fig. 27, 28, Pl. 6, G, H)

Basidiocarpus resupinatum, late effusum, tenuis, lenis, membranaceum vel ceraceae, cremea; Margo floccosus, tenuis; Spinae non coactum, lanceolate, 0.5～1 mm longae; Subiculum floccosus, cremea, 0.2～0.3 mm altus; Subiculum hyphae leptodermus, fibuligerus, 4～5μ diam.; Cystidia cylindraceus, 5～6μ diam.; Basidia clavata, 5μ diam.; Sporae globosus vel subglobosus, laevis, hyalinus, 4～5×4～5μ, non-amyloideus.

Macroscopic characters.

Basidiocarps resupinate, widely effused, thin, soft, membranaceous to ceraceous, not easily separable from the substratum, often cracked in dried specimen, white to cartridge buff to pinkish buff; Spines not crowded, lanceolate, pointed, rigid, 0.5～1 mm long, 2～3 spines per 1 mm; Subiculum soft, floccose, white to cream buff, 0.2～0.3 mm thick.

Microscopic characters.

Subiculum hyphae loosely arranged, almost thin-walled, with clamp connections, frequently branched, wall surface smooth, 4～5μ wide; Cystidia abundant in hymenial layer and at the apex of the spines, cylindrical, thin-walled, not incrusted, with septate, without clamp connections, 5～6μ wide, projecting 25～35μ; Basidia clavate, 5μ wide, 4-spored; Basidiospores globose to subglobose, smooth, hyaline, 4～5×4～5μ, non-amyloid.

Cultural characters.

Growth characters : Growth very slow, forming a mycelial mat 1.7 cm in diameter in 10

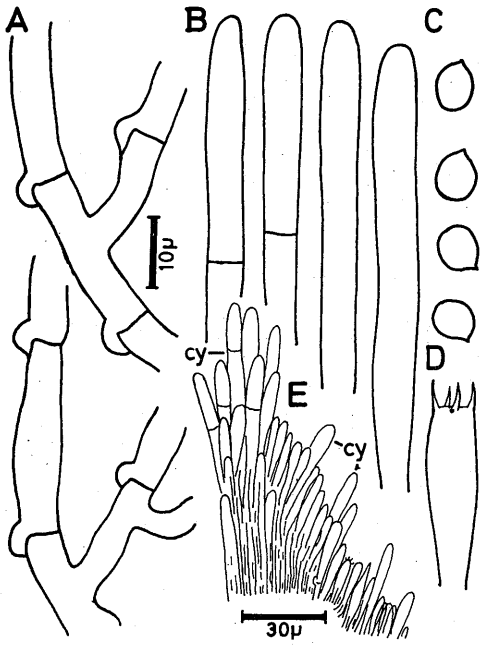

Fig. 27 Microscopic elements of *Odontia lanceolatum* Furukawa (F-10050)
A : Subiculum hyphae B, cy : Cystidia
C : Basidiospores D : Basidia
E : Long section of spine

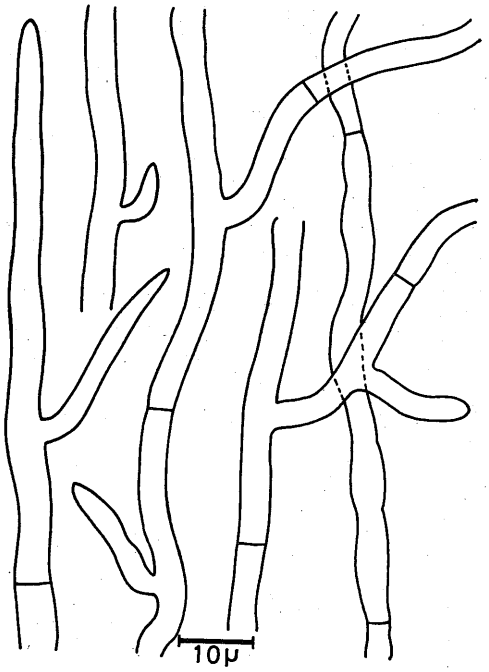

Fig. 28 Mycelial structure from a culture of *Odontia lanceolatum* Furukawa (Od 5a)

days on malt agar medium, 20 cm in diameter in 10 days on potato glucose agar medium, white, usually thin, closely appressed chamois-like, sometimes with scant aerial hyphae; Margin appressed, colorless, even; Odorless.

Hyphal characters : Thin-walled, hyaline, wall surface smooth, clamp connections rarely seen, sometimes branched.

Temperature relations : Optimum approximately 20°C. Average diameters of mycelial mat in 10 days in the dark at constant temperatures follow : 1.7 cm, 20°C; 1.5 cm, 25°C; 1.2 cm, 30°C; trace, 35°C on malt agar medium, 2.0 cm, 20°C; 1.4 cm, 25°C; 1.4 cm, 30°C; trace, 35°C on potato glucose agar medium.

Habitat : Growing on bark of branches and stems of dead coniferous trees, associated with a white rot.

Japanese name : Togari-komebatake (Furukawa).

Distribution : Asia (Japan).

Specimen examined.

Asakawa, Tokyo, on *Abies firma*, 8-X-1962, H. F., (F-10050 ♂ Od 5a, Type).

Note.

O. sudans (Alb. et Schw. ex Fr.) Bres. is similar to this species which has cystidia protruded in bundles, but differs in having lumps of secretion which appear to be gluing together within the tissue of the spine.

Macroscopically, the shape of cystidia is completely different.

25) ***Odontia subabrupta*** **BOURDOT et GALZIN** (Fig. 29, Pl. 7, A, B)

Hym. Fr., 430, 1927; NIKOLAJEVA, Fl. Pl. Crypt. URSS 6(2) : 103, 1961.

Macroscopic characters.

Basidiocarps resupinate, widely effused, very hard, not easily separated, ceraceous to cartilaginous, not cracked, faintly fragile in dried specimen; Hymenial surface pale pinkish buff, pinkish buff to vinaceous buff; Margin distinct; Spines crowded, very small, warty, pointed or slightly divided at the apex, 0.3～0.4 mm long, 0.2～0.3 mm in diam., 6～7 spines per 1 mm; Subiculum thin, hard, pinkish buff, 0.4～0.5 mm thick.

Microscopic characters.

Subiculum hyphae very narrow, thin-walled, with clamp connections, branching at right angles, 2.5μ wide; Cystidia clavate, thin-walled, 7～8×30μ, projecting up to 15μ; Basidia clavate, 4.5×15μ, 4-spored, sterigmata 3.5～4μ long; Basidiospores small, globose, smooth, hyaline, 2～2.5×3.5～4μ.

Habitat : On bark of branches and stems of dead broad-leaved trees, associated with a white rot.

Japanese name : Hime-komebatake (FURUKAWA).

Distribution : Europe and Asia (Japan, USSR).

Specimen examined.

Chichibu, Saitama pref., on bark of dead *Quercus* sp., 11-XI-1969, K. A., Y. H. & T. K., (F-11267).

Note.

Fruit bobies are widely effused over the substrata, and its margin is very distinct. Microscopically, this species is characterized in that hyphae are very narrow and branched at right angles and also spores are small.

According to NIKOLAJEVA (1961), *O. subabrupta* is parasitic on the oak and beech trees. It actually was found in a specimen collected on the bark of *Quercus* sp. in Japan.

26) ***Odontia queletii*** **BOURDOT et GALZIN** (Fig. 30, Pl. 7, C, D).

Bull. Soc. Myc. Fr., 30 : 270, 1914, Hym. Fr., 435, 1927 : PILÁT, Bull. Soc. Myc. Fr., 49 : 299, 1933; MILLER, Mycologia, 26 : 16, 1934; NIKOLAJEVA, Fl. Pl. Crypt. URSS 6(2) : 133, 1961.

Synonym : *Phlebia queletii* (BOUR. et GALZ.) CHRISTIANSEN, Dansk Bot. Arkiv, 19(2) : 176, 1960.

Macroscopic characters.

Basidiocarps resupinate, effused, very thin, hard, ceraceous or subcrustaceous, not cracked, white to cinnamon buff; Margin not distinct or narrowly limited, fibrillose; Spines scattered or confluent in groups, subulate to short cylindrical, obtuse, fimbriate, 0.1～0.2 mm diam., 0.3～0.5 mm long; Subiculum hard, white to cinnamon buff, 150～300μ thick.

Microscopic characters.

Subiculum hyphae compactly arranged, thin-walled or thick-walled, frequently branched, with clamp connections, 2.5～5μ wide; Tramal hyphae as in Subiculum; Cystidia numerous, usually fusiform, occasionally cylindrical or clavate, thick-walled, incrusted, 6～13×40～90μ projecting 10～30μ; Cystidia like hyphae with small crystallization in hymenial layer, projecting 12～20μ from hymenial surface or embedded in subiculum tissue; Basidia cylindrical-clavate, 3.5～5×15～30μ, 4-spored; Basidiospores ovoid, smooth, hyaline, 3～4×5～5.5μ, sometimes one guttulate.

Habitat : Growing on broad-leaved trees, associated with a white rot.

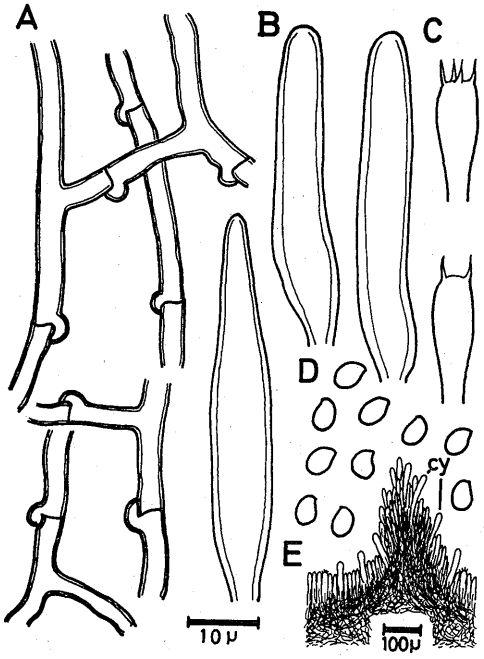

Fig. 29 Microscopic elements of *Odontia subabrupta* Bourd. et Galz. (F-11267)
A : Subiculum hyphae B, cy : Cystidia
C : Basidia D : Basidiospores
E : Long section of spine

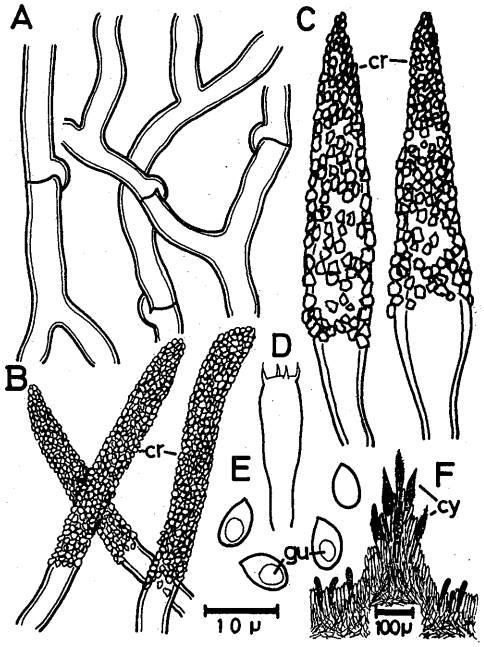

Fig. 30 Microscopic elements of *Odontia queletii* Bourd. et Galz. (F-11259)
A : Subiculum hyphae B : Cystidia like hyphae in hymenial layer
C, cy : Cystidia D : Basidia
E : Basidiospores
F : Long section of spine
cr : Crystals gu : Guttulate

Japanese name : Kata-komebatake (Furukawa).

Distribution : Europe, North America and Asia (Japan, USSR).

Specimens examined.

Kiyosumi, Chiba pref., on bark of dead broad-leaved tree, 24-X-1969, K. A., Y. H. & H. F., (F-11259); Towada, Aomori pref., on bark of dead broad-leaved tree, 26-IX-1964, Y. H., (F-11260); Hakutojinja, Tottori pref., on broad-leaved tree, 18-IX-1963, K. A., (F-11263).

Note.

The fruit body of this species is crustaceous and very hard. The spape of cystidia resembles that of *O. fimbriata* (Pers.) Fr., but the apex of cystidia of this species is pointed and lanceolate.

Christiansen (1960) transferred this species to the genus *Phlebia*, but this species has distinct spines and cystidia. Therefore, this species should be placed under the genus *Odontia*.

27) ***Odontia crustosa*** (**Persoon ex Fries**) **Quélet** (Fig. 31, Pl. 7, E, F)

Fl. Myc. Fr., 436, 1888; Bourdot et Galzin, Hym. Fr., 431, 1927; Pilát, Bull. Soc. Myc. Fr., 49 : 299, 1933, 51 : 397, 1935; Miller, Mycologia, 26 : 28, 1934; Christiansen, Friesia, 4 : 320, 1952; Cunningham, Tran. Roy. Soc. New Zealand, 86 : 76, 1959; Nikolajeva, Fl. Pl. Crypt. URSS 6(2) : 121, 1961; Furukawa & Aoshima, Trans. mycol. Soc. Japan, 7(2～3) : 150, 1966.

Synonym : *Hydnum crustosum* Pers. ex Fr., Syst. Myc., 1 : 419, 1821.

Grandinia crustosa (Pers. ex Fr.) Fr., Epic., 528, 1836～1838, Hym. Eur., 627, 1874.
Hyphodontia crustosa (Pers. ex Fr.) Eriksson, Symb. Bot. Upsal., 16(1) : 104, 1958; Christiansen, Dansk Bot. Arkiv, 19(2) : 224, 1960.

Macroscopic characters.

Basidiocarps resupinate, widely effused, adnate, ceraceous or crustaceous, usually cracked, pinkish buff to yellowish buff; Margin white, pruinose or narrowly floccose; Spines crowded, subulate to short cylindrical, obtuse, small, 0.4～0.5 mm diam., 0.8～1.0 mm long, 2～3 spines per 1 mm; Subiculum thin, cream, 0.6～0.8 mm thick.

Microscopic characters.

Subiculum hyphae distinct, loosely arranged, thin-walled, slightly swollen, frequently branched, with clamp connections, 3～4μ wide; Cystidia numerous in the hymenium, subulate, 3～4μ wide; Basidia clavate, 5×15～20μ, 4-spored; Basidiospores elliptical, slightly flattened on one side, smooth, hyaline, 3.5～4×5～7.5μ, sometimes one guttulate.

Habitat : Growing on dead deciduous trees, associated with a white rot.

Japanese name : Hibiware-komebatake (Furukawa & Aoshima).

Distribution : Europe, North America, New Zealand and Asia (Japan, USSR).

Specimens examined.

Nobeyama, Nagano pref., on hard wood, XI-1961, K. A. & Y. H., (F-10607); Yamabe, Hokkaido, on *Sorbus alnifolis*, VIII-1934, U. Iwaide, (TNS 206686); Ikarigasaki, Aomori pref., on broad-leaved tree, 3-X-1953, S. Sato, (F-10609); Towada, Aomori pref., on *Quercus* sp., 24-IX-1964, Y. H., (F-11232); 2-gome, Fuji, Yamanashi pref., on dead branch of *Prunus* sp., 1-VI-

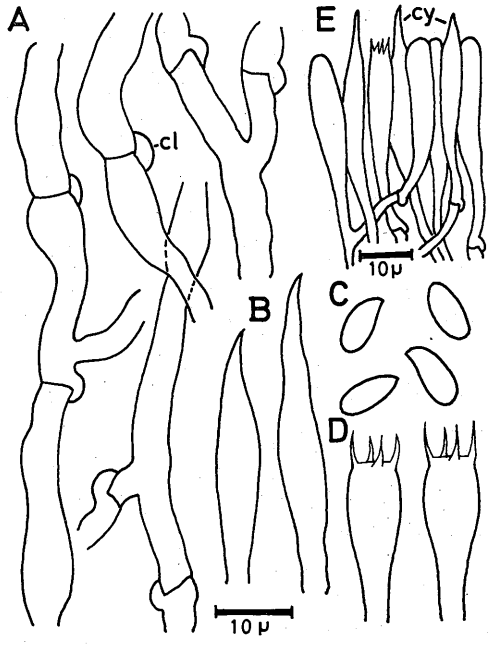

Fig. 31 Microscopic elements of *Odontia crustosa* (Fr.) Quél. (F-10607)
A : Subiculum hyphae B, cy : Cystidia
C : Basidiospores D : Basidia
E : Hymenium cl : Clamp connections

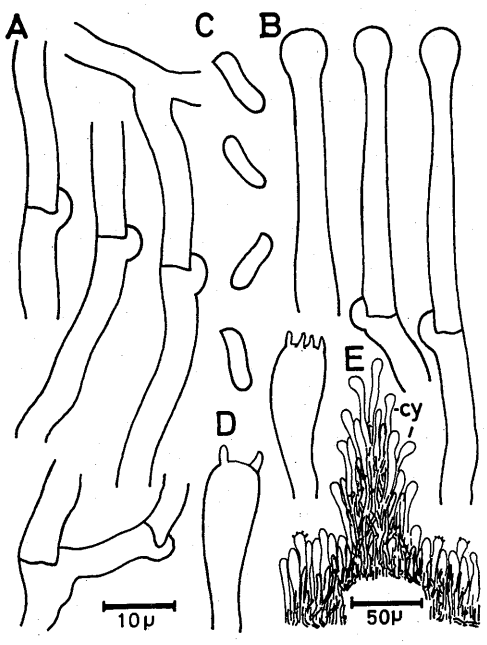

Fig. 32 Microscopic elements of *Odontia macroverruca* Furukawa (F-11219)
A : Subiculum hyphae B, cy : Cystidia
C : Basidiospores D : Basidia
E : Long section of spine

1950, K. A., (F-10608); 3～5-gome, Fuji, Yamanashi pref., on dead broad-leaved tree, 5-X-1961, H. F., (F-11233); Kaida, Nishichikuma, Nagano pref., on dead branch of *Castanea crenata*, 3-IX-1963, Y. H. & H. F., (F-11231); Sugadaira, Nagano pref., on dead branch of broad-leaved tree, 3-X-1969, Y. H., (F-11352, F-11353); Kawakami, Mie pref., on *Quercus* sp., 27-VII-1967, H. F., (F-11354); Hirai, Kozagawa, Wakayama pref., on bark of broad-leaved tree, 30-VII-1967, H. F., (F-11210).

Note.

Miller (1934b) described the color of the fruit body of this species as being pinkish buff to cinnamon buff. But, many of the specimens collected in Japan shows pinkish buff with some shades of yellow. When fruit bodies are dried up, fine cracks appear and a great deal of conical-shaped cystidia is clearly recognized under a lens.

28) ***Odontia macroverruca*** **Furukawa** sp. nov. (Fig. 32, Pl. 7, G, H)

Basidiocarpus resupinatum, late effusum, tenuis, durusum, tomentosus vel ceraceus, pallide ochraceus salmoris vel pallide chraceus luteum; Margo tomentosus, tenuis, pallide ochraceus salmoris; Spinae conicae vel cylindraceus, 0.1～1 mm diam., 1 mm longae; Subiculum durusum, tenuis, pallide ochraceus salmoris, 0.2～0.3 mm altus; Subiculum hyphae leptodermus, fibuligerus, paniculate, 2.5～4μ diam.; Cystidia capitulatus, 2.5μ diam., globosus partis 5μ diam.; Basidia clavata, 5×17μ; Sporae subfusiformis, laevis, hyalinus, 3.5～4×7.5～8.5μ, non-amyloideus.

Macroscopic characters.

Basidiocarps resupinate, widely effused, thin, hard, tomentose to ceraceous, not easily separated from the substratum, becoming cracked, white to pale ochraceous salmon or light ochraceous buff; Margin irregular and indistinct, tomentose, thin, soft, white to pale ochraceous salmon; Spines not crowded, conical or cylindrical, slightly divided at the apex, 0.5～1.0 mm in diam., less than 1.0 mm long; Subiculum hard, thin, pale ochraceous salmon, 0.2～0.3 mm thick.

Microscopic characters.

Subiculum hyphae compactly arranged, thin-walled, with clamp connections, frequently branched, 2.5～4μ wide; Cystidia abundant at the apex of the spines, capitulate, 2.5μ wide, globose part 5μ diam.; Basidia clavate, 5×17μ, 2～4 spored; Basidiospores subfusiform, smooth, hyaline, 3.5～4×7.5～8.5μ, non-amyloid.

Habitat : On bark of dead broad-leaved trees, associated with a white rot.

Japanese name : Oohari-komebatake (Furukawa).

Distribution : Asia (Japan).

Specimen examined.

Towada, Aomori pref., on broad-leaved tree, 27-IX-1964, Y. H., (F-11219 Type).

Note.

This species is characterized in having larger and scattered spines.

29) ***Odontia pelliculae*** **Furukawa** sp. nov. (Fig. 33, Pl. 8, A, B)

Basidiocarpus resupinatum, effusum, tenuis, durusum, coriaceus, pallide ochraceum luteum; Spinae conicae, obtusatus, 0.3～0.4 mm longae; Margo tomentosus, tenuis, pallide ochraceum luteum; Subiculum pallide luteum, 75～100μ altus; Subiculum hyphae leptodermus, paniculatus, fibuligerus, 2.5～3.5μ diam.; Cystidia clavata vel capitulate, 10～17μ diam., 30～35μ longae;

Sporae ellipsoideus, laevis, hyalinus, 3.5×5.5μ, non-amyloideus.

Macroscopic characters.

Basidiocarps resupinate, effused, thin, hard, coriaceous, skin or leather-like, not separable from the substratum, often cracked in dried specimen, pale ochraceous buff to seashell pink; Spines very small, not crowded, conical, obtuse, 0.3～0.4 mm long, 5～6 spines per 1 mm; Margin tomentose, thin, white to pale ochraceous buff; Subiculum pale ochraceous buff, 75～100μ thick.

Microscopic characters.

Subiculum hyphae distinct, loosely arranged, thin-walled, frequently branched, with clamp connections, 2.5～3.5μ wide; Cystidia numerous, clavate or lecythiform, not incrusted, 10～17μ wide, 30～35μ long, projecting 10～15μ long; Basidiospores ellipsoid, smooth, hyaline, 3.5×5.5μ, non-amyloid.

Habitat : On dead wood of broad-leaved tree, associated with a white rot.

Japanese name : Kawa-komebatake (FURUKAWA).

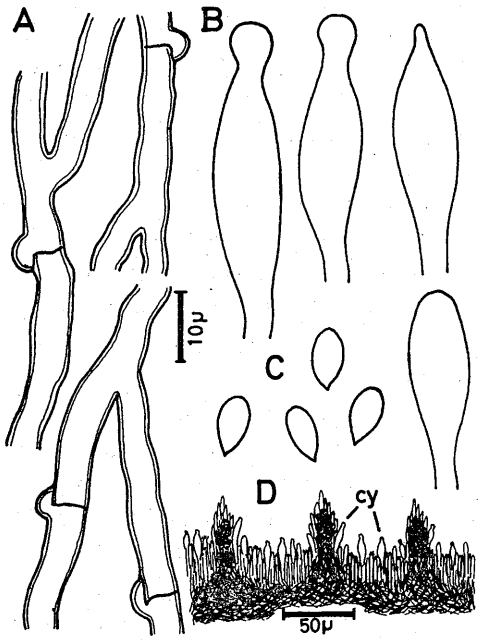

Fig. 33 Microscopic elements of *Odontia pelliculae* FURUKAWA (F-11324)
A : Subiculum hyphae　B, cy : Cystidia
C : Basidiospores
D : Long section of spine

Specimen examined.

Kumano, Wakayama pref., on broad-leaved tree, III-1966, K. A., (F-11324 Type).

Note.

The fruit body of this species has thin cortex and looks leathery at a glance. Spines are very small and conical-shaped.

30) ***Odontia mucronata*** **FURUKAWA** sp. nov. (Fig. 34, 35, Pl. 8, C, D, 12, C)

Basidiocarpus resupinatum, late effusum, ceraceum, durusum, rimosa, pallide luteum vel pallide ochraceous luteum; Margo tomentosus, tenuis, pallide luteum; Spinae coactus, subuliformis vel cylindraceus, 0.2～0.4 mm diam., 0.5～1 mm longae; Subiculum tenuis, pallide luteum, 0.2～0.3 mm alutus; Subiculum hyphae leptodermus, paniculatus, fibuligerus, 3.5～5μ diam.; Cystidia obclavata, 5～7.5×30～40μ; Basidia clavata vel cylindraceus, 4μ diam.; Sporae ellipsoideus, laevis, hyalinus, 5×7.5～9μ.

Macroscopic characters.

Basidiocarps resupinate, widely effused, ceraceous, hard, cracked, white to light buff or light ochraceous buff; Margin tomentose, thin, white to light buff; Spines crowded, often adhering in small groups of 5～8, obtuse, with the crests divided at the apical portion of the spines, subilate or short cylindrical, 0.2～0.4 mm diam., 0.5～1.0 mm long, 5～6 spines per 1 mm; Subiculum thin, hard, light buff, 0.2～0.3 mm thick.

Microscopic characters.

Subiculum hyphae almost thin-walled, frequently branched, with clamp connections, 3.5～

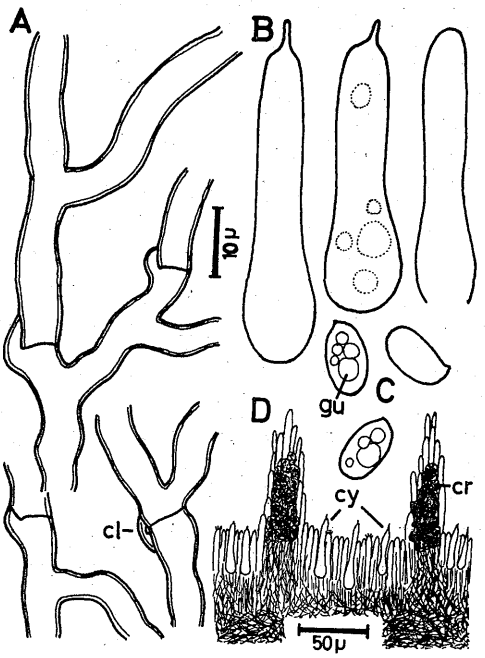

Fig. 34 Microscopic elements of *Odontia mucronata* Furukawa (F-10982)
A : Subiculum hyphae B, cy : Cystidia
C : Basidiospores
D : Long section of spine cr : Crystals
cl : Clamp connections gu : Guttulate

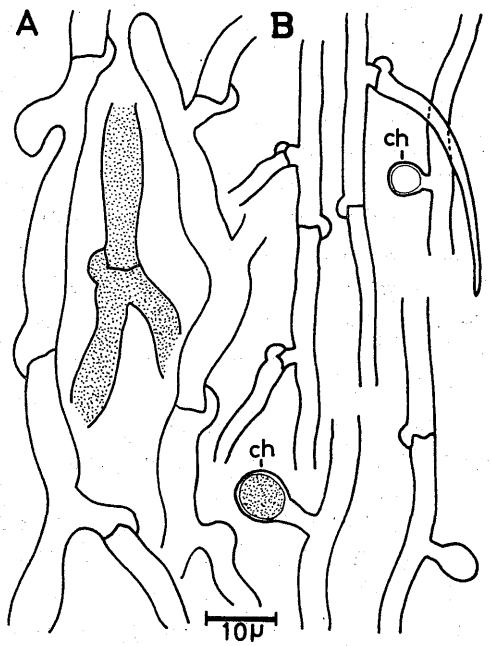

Fig. 35 Mycelial structure from a culture of *Odontia mucronata* Furukawa (Od 24a)
A : Aerial hyphae B : Submerged hyphae
ch : Chlamydospores

5μ wide; Cystidia numerous, mucronate, with the process at the apical portion, enlarged at the base, most parts embedded into the hymenial layer, 5～7.5×30～40μ; Basidia clavate or cylindrical, 4μ wide, 4-spored; Basidispores ellipsoid, smooth, hyaline, 5×7.5～9μ, non-amyloid, sometimes 2～4 guttulate.

Cultural characters.

Growth characters : Growth medium, forming a mycelial mat 6 cm in diameter in 10 days on malt agar medium, 4.5 cm in diameter in 10 days on potato glucose agar medium, white, floccose, compact; Margin usually thin, floccose, colorless, even; Odorless.

Hyphal characters : Aerial hyphae thin-walled, hyaline, with clamp connections, sometimes branched, 4～5μ wide; Submerged hyphae thin-walled, hyaline, with clamps, sometimes branched, 2.5～3.5μ wide; Chlamydospores usually abundant, globose, 5～10μ diameter.

Temperature relation : Optimum 25°C. Average mycelial mat diameter in 10 days in dark at constant temperatures follow : 3.6 cm, 20°C; 5.8 cm, 25°C; 5.0 cm, 30°C; 2.0 cm, 35°C on malt agar medium, 3.3 cm, 20°C; 4.5 cm, 25°C; 4.0 cm, 30°C; 1.5 cm, 35°C on potato glucose agar medium.

Habitat : Growing on bark of branches and stems of dead coniferous and broad-leaved trees, associated with a white rot.

Japanese name : Minami-komebatake (Furukawa).

Distribution : Asia (Japan).

Specimens examined.

Kaimon, Kagoshima pref., on *Pinus* sp., 16-X-1966, H. F., (F-10982 Type); Takahagi, Ibaraki pref., on *Quercus*, VIII-1948, K. A., (F-11309); Chichibu, Saitama pref., on *Quercus*, 11-XI-1969, K. A., Y. H. & T. K., (F-11381), on *Quercus*, 27-III-1963, K. A., (F-11382); Asakawa, Tokyo, on *Pinus*, 21-X-1963, Y. H., (F-11387), on *Quercus*, 29-VII-1966, H. F. & Y. H., (F-11380), on *Pinus*, 11-X-1968, H. F., (F-11379); Aono, Minamiizu, Shizuoka pref., on broad-leaved tree, 24-III-1966, H. F., (F-11386); Hamakita, Shizuoka pref., on *Quercus*, V-1969, H. Muto, (F-11387, F-11388); Kawakami, Mie pref., on broad-leaved tree, 27-VII-1967, H. F., (F-11389); Hirai, Kozagawa, Wakayama pref., on broad-leaved tree, 30-VII-1967, H. F., (F-11039, F-11051 ♂ Od 24a, F-11384, F-11385); Yamaguchi, Kitamorogata, Miyazaki pref., on *Quercus*, 11-V-1962, H. F., (F-11391); Hetsuka, Uchinoura, Kagoshima pref., on broad-leaved tree, 15-X-1963, K. A. & H. F., (F-11221); Sata, Kagoshima pref., on broad-leaved tree, 20-X-1963, K. A. & H. F., (F-11377).

Note.

This species has no particularly distinctive characteristic macroscopically, but microscopically it has peculiarly shaped cystidia.

31) ***Odontia spathulata*** (**SCHRADER ex FRIES**) **LITSCHAUER** (Fig. 36, Pl. 8, E, F)

Österr. Bot. Zeitschr. 88 : 125, 1939; AOSHIMA & FURUKAWA, Trans. mycol. Soc. Japan, 7(2～3) : 145, 1966.

Synonym : *Hydnum spathulatum* SCHRADER ex FRIES, Syst. Myc. 1 : 432, 1821.

Irpex spathulatus (SCHRAD. ex FR.) FR., Elench. Fung., 1 : 145, 1828.

Radulum spathulatum (FR.) BRESADOLA, in MILLER, Mycologia, 26 : 25, 1934.

Odontia arguta f. *spathulata* (FR.) WAKEFIELD, in NIKOLAJEVA, Fl. Pl. Crypt. URSS 6(2) : 113, 1961.

Irpex ambiguus PECK, N. Y. State Mus. Rep., 40 : 53, 1887, in GILBERTSON, Mycologia, 54 : 695, 1962.

Hydnum caryphylleum BERKELEY & CURTIS, Grevillea, 1 : 100, 1873, in GILBERTSON, Mycologia, 57 : 850, 1965.

Hydnum pithyophilum BERK. et CURT., HOOKER's Jour. Bot. and Kew Gard. Misc., 1 : 235, 1849, in GILBERTSON, Mycologia, 57 : 861, 1965.

Hydnum velatum BERK. et CURT., Grevillea, 1 : 100, 1873, in GILBERTSON, Mycologia, 57 : 867, 1965.

Hydnum xanthum BERK. et CURT., Grevillea, 1 : 98, 1873, in GILBERTSON, Mycologia, 57 : 868, 1965.

Macroscopic characters.

Basidiocarps annual, resupinate, widely effused, soft, not easily separated, ceraceus or subceraceous; Hymenial layer floccose, often cracked in dried specimen, cartridge buff to light ochraceous buff; Margin tomentose, white to light buff; Spines variable in shape, subulate, cylindrical, spathulate, irpiciform, obtuse or pointed, 1.5～3 mm long; Subiculum soft, pale buff, 1.5～2.0 mm thick.

Microscopic characters.

Subiculum hyphae loosely arranged, thin-walled, frequently branched, with abundant clamp connections, slightly incrusted, 2.5～3.5 μ wide; Cystidia not distinct, some slender hyphoid cystidia at the apex of the spines, smooth or slightly incrusted, 2.5～3.5 μ wide, projecting 15～30 μ long; Basidia clavate, 5～6×12～15 μ, 4-spored; Basidiospores ovoid or elliptical, smooth, hyaline, 3～4×4～6 μ, sometimes one guttulate.

Habitat : On wood of deciduous and coniferous trees, associated with a white rot.

Japanese name : Herabatake (Aoshima & Furukawa).

Distribution : Europe, North America and Asia (Japan, USSR).

Specimens examined.

Narusawa, Yamanashi pref., on *Larix leptolepis*, II-1950, K. A., (F-10768, F-10769) ; Otoineppu, Hokkaido, on coniferous tree, 7-IX-1969, K. A., Y. H. & H. F., (F-11369, F-11370) ; Tomakomai, Hokkaido, on *Picea jezoensis*, 19-IX-1961, Y. H., (F-10537, F-10538, F-10742) ; Maruyama, Tomakomai, Hokkaido, on *Picea jezoensis*, 21-IX-1962, Y. H., (F-10783, F-10563) ; Soounkyo, Hokkaido, on coniferous tree, 14-VIII-1963, K. A., (F-10564) ; on coniferous tree, VIII-1952, R. Imazeki & K. A., (F-10562) ; Eniwa, Hokkaido, on *Picea jezoensis*, 10-VIII-1963, K. A., Y. H. & T. K., (F-11371) ; Yamabe, Hokkaido, on *Picea jezoensis*, 25-IX-1962, Y. H., (F-11372) ; 2-gome, Fuji, Yamanashi pref., on coniferous tree, 6-X-1964, H. F. & T. K., (F-11376) ; Aokigahara Yamanashi pref., on coniferous tree, 30-X-1965, H. F., (F-10732) ; Meguro, Tokyo, on coniferous tree, 10-VI-1968, K. A., (F-11374) ; Misakubo, Shizuoka pref., on *Tsuga*, 14-XI-1961, K. A. & Y. H., (F-10539) ; Gotenba, Shizuoka pref., on coniferous tree, 10-XI-1961, K. A. & Y. H., (F-11373) ; Misakubo, Gotenba, Shizuoka pref., on *Tsuga*, 20-X-1964, K. A., (F-11375).

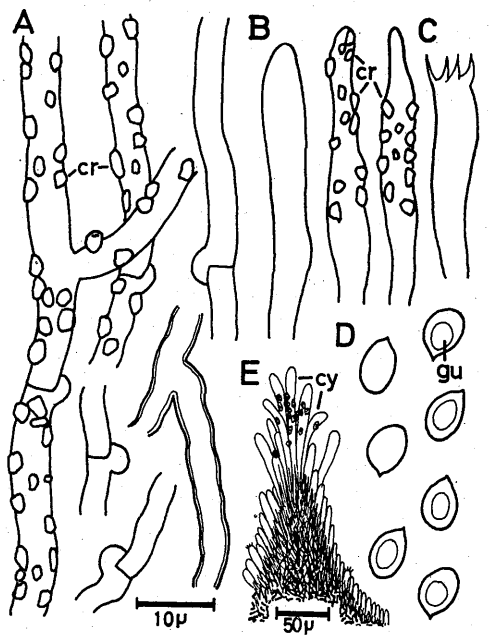

Fig. 36 Microscopic elements of *Odontia spathulata* (Schrad. ex Fr.) Litsch. (F-10768)
A : Subiculum hyphae B, cy : Cystidia
C : Basidia D : Basidiospores
E : Long section of spine
cr : Crystals gu : Guttulate

Note.

The shape and size of spines of this species are very variable, but most of the Japanese collection examined by the writer have spathulate spines.

This species usually grows on barks and stems of coniferous and broad-leaved trees and causes a white rot to logs. It was also reported that it caused considerable damage to the wooden structures in N. Y. State, U. S. A. (Silverborg, 1953). In Japan (Aoshima and Furukawa, 1966b), it has been also confirmed that this species was found in the pillars and ceiling of warehouses, causing great damage.

2. ***Mycoacia*** **Donk**

Med. Nod. mycol. Ver., 18～20 : 150, 1931 ; Christiansen, Dansk Bot. Arkiv, 19(2) : 176, 1960 ; Aoshima & Furukawa, Trans. mycol. Soc. Japan, 7(2～3) : 134, 1966.

Basidocarps resupinate, closely adnate, waxy ; Hymenium covering downward directed spines ; Subiculum hyphae thin-walled ; Cystidia few or lacking ; Spores hyaline, smooth, non-amyloid.

Family : Hydnaceae.

Type species : *Hydnum fusco-atrum* Fries ex Fries.

Japanese name : Hiiro-haritake-zoku (Aoshima & Furukawa).

Species in Japan : *M. chrysorhiza* (Torrey) Aoshima et Furukawa, *M. chrysella* (Berk. et Curt.) Furukawa, *M. himantia* (Schw.) Miller et Boyle, *M. copelandii* (Pat.) Aoshima et Furukawa.

Note.

Miller (1933a) established the genus *Oxydontia* indicating *Hydnum setosum* Pers. as type species. He included six species in this genus, but afterwards he (1943) placed this genus in a synonym of *Mycoacia*. Rogers & Martin (1958) accepted the genus *Oxydontia* Miller, and made a new combination of *O. chrysorhiza* (Torrey) Rogers et Martin which antedate *O. fragilissima* (Berk. et Curt.) Miller. Nikolajeva (1961) accepted the genus *Sarcodontia* S. Schulz. and placed the two genera *Mycoacia* and *Oxydontia* in its synonyms. Type species of the genus *Sarcodontia* is *S. mali* Schulz. Which was treated as a synonym for *S. setosa* (Pers.) Donk by Donk (1956). Then, the genus *Oxydontia* is congeneric with *Sarcodontia*, showing that the former is a synonym of the latter. In *Sarcodontia setosa* subiculum hyphae are mostly thick-wolled, and in the hymenium there are two types of cystidia. In *Mycoacia fusco-atrum* Fr. ex Fr., type species of the genus *Mycoacia* Donk, Subiculum hyphae are thin-walled, and in the hymenium no distinct cystidia present.

For this reason, Aoshima & Furukawa (1966a) accepted both genera as two distinct genera, and they recorded three species of *Mycoacia* from Japan. One more species is newly recorded from Japan and described in this paper.

Key to Japanese species of *Mycoacia*

A 1 : Basidiocarps orange to scarlet or yellow.

B 1 : With rhizomorphic strands, tramal hyphae not branched, spores 2.5×4μ ..... *M. chrysorhiza* (1)

B 2 : Without rhizomorphic strands, tramal hyphae branched, spores 3～3.5×4～5μ ..... *M. chrysella* (2)

A 2 : Basidiocarps white to light ochraceous buff.

B 1 : Basidiocarps floccose, spines less than 6 mm in length, spores cylindrical-ellipsoid, 5×10～12μ ..... *M. himantia* (3)

B 2 : Basidiocarps coriaceous, spines more than 5 mm in length, spores globose, 5～6×6μ ..... *M. copelandii* (4)

1) ***Mycoacia chrysorhiza* (Torrey) Aoshima et Furukawa** (Fig. 37, 38, Pl. 8, G, H, 12, D)
Trans. mycol. Soc. Japan, 7(2～3) : 135, 1966.

Synonym : *Hydnum chrysorhizum* Torrey, in Eaton, Manual of Botany, ed. 3, 309, 1822.

Oxydontia chrysorhiza (Torrey) Rogers et Martin, Mycologia, 50 : 308, 1958; Gilbertson, Pap. Mich. Acad. Soi. Arts & Lett., 49 : 23, 1964.

Hydnum fragilissinum Berkeley et Curtis, Grevillea, 1 : 100, 1873.

Mycoacia fragilissima (Berk. et Curt.) Miller et Boyle, Univ. Iowa Stud. Nat. Hist., 18(2) : 42, 1943.

Sarcodontia fragilissima (Bert. et Curt.) Nikolajeva, Fl. Pl. Crypt. URSS 6(2) : 184, 1961.

Oxydontia fragilissima (Berk. et Curt.) Miller, Mycologia, 25 : 364, 1933.

Odontia fragilissima (Berk. et Curt.) Brown, Bot. Gaz., 96 : 659, 1935.

Hydnum chrysocomum Underwood, Torrey Bot. Club Bull. 24 : 82, 1897, in Gilbertson, Pap. Mich. Acad. Sci. Arts & Lett., 49 : 24, 1964.

Hydnum omnivorum Shear, Jour. Agr. Res., 30 : 476, 1925, in Gilbertson, Pap. Mich. Acad. Sci. Arts & Lett., 49 : 22, 1964.

Macroscopic characters.

Basidiocarps resupinate, thin, soft, fleshy to ceraceous, membranaceous, separable, often becoming partially detached in drying, orange to cadmium orange or flame scarlet; Margin white at first then orange buff, fibrillose and with long, orange buff rhizomorphic strands running loosely over the substratum; Spines slender, terete, occasionally confluent, scattered to crowded, 1～4 mm long; Subiculum soft, tomentose, orange, 0.3～0.5 mm thick.

Microscopic characters.

Suciculum hyphae loosely arranged, thin-walled, sometimes branched, with clamp connections, often swollen at the septa, 5～7.5μ wide; Tramal hyphae compactly arranged, thin-walled, not branching, without clamp connections, 2.5～3.5μ wide; Basidia clavate, 4～6×10～15μ, 2～4 spored; Basidiospores ellipsoid, smooth, hyaline, 2.5×4μ.

Cultural characters.

Growth characters : Growth medium, forming a mat 4 to 5 cm in diameter in 10 days on malt agar medium and potato glucose agar medium, white at first, becoming yellow to orange, cottony; Margin floccose at first, then produces rhizomorphs, pale yellow to orange; Odorless.

Hyphal characters : Aerial hyphae mostly thin-walled, walls surface smooth or incrusted, with clamp connections, frequently branched, 5～8μ wide; Submerged hyphae thin-walled,

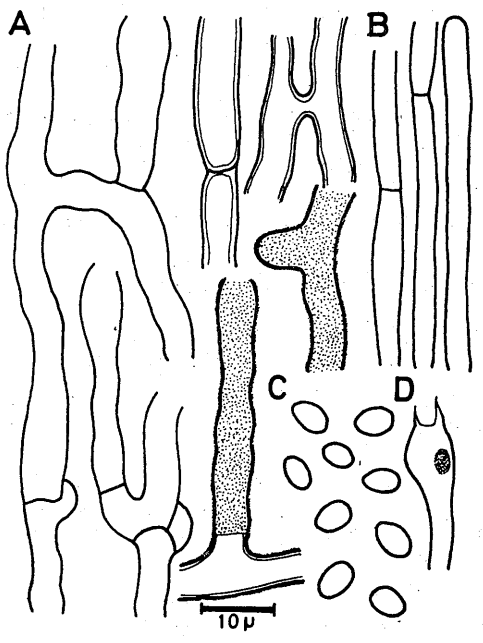

Fig. 37 Microscopic elements of *Mycoacia chrysorhiza* (Torrey) Aoshima et Furukawa (F-10213)
A : Subiculum hyphae B : Tramal hyphae
C : Basidiospores D : Basidia

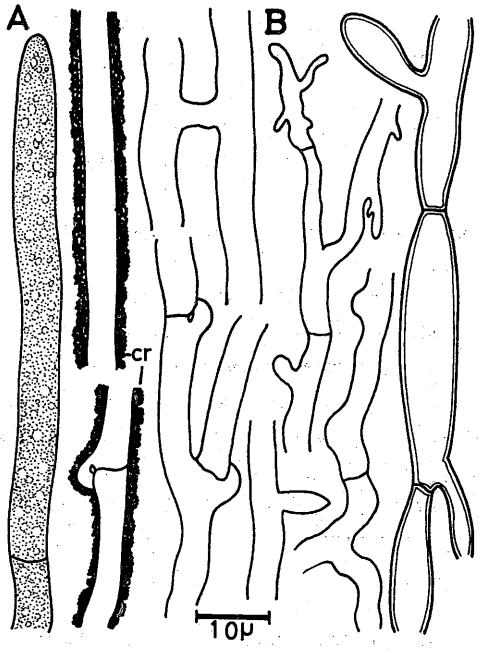

Fig. 38 Mycelial structure from a culture of *Mycoacia chrysorhiza* (Torrey) Aoshima et Furukawa (Od 7b)
A : Aerial hyphae B : Submerged hyphae
cr : Crystals on the surface of mycelia

walls surface smooth, without clamp connections, frequently branched and sometimes swollen, 5～10μ wide; No conidia and chlamydospores.

Temperature relations : Optimum 25°～30°C. Average mycelial mat diameters in 10 days in dark at constant temperatures follow : 4.0 cm, 20°C; 4.3 cm, 25°C; 4.3 cm, 30°C; 2.0 cm, 35°C on malt agar medium, 4.3 cm, 20°C; 4.6 cm, 25°C; 4.7 cm, 30°C; 2.0 cm, 35°C on potato glucose agar medium.

Habitat : Growing on barks of coniferous and deciduous trees, associated with a white rot.

Japanese name : Hiiro-haritake (Aoshima & Furukawa).

Distribution : North America and Asia (Japan, USSR).

Specimens examined.

Shikotsu, Hokkaido, on broad-leaved tree, 10-VIII-1963, K. A., Y. H. & T. K., (F-10231, F-10232, F-10237); Towada, Aomori pref., on dead broad-leaved tree, 2-IX-1966, T. K., (F-11402); Hanawa, Fukushima pref., on bark of *Quercus*, VIII-1968, R. Ootake, (F-11403); Matsunoyama, Niigata pref., on *Quercus*, K. A. & Y. H., (F-11404); Meguro, Tokyo. on *Quercus*, (bed logs of Shiitake mushroom), IX-1964, H. F., (F-10461); Asakawa, Tokyo, on *Quercus*, 29-VII-1966, H. F., (F-10771), 12-IX-1966, H. F. & Y. H., (F-11406); 2-gome, Fuji, Yamanashi pref., on broad-leaved tree, 6-X-1964, H. F. & T. K., (F-10462), 3-IX-1951, K. A., (F-10464); Sugadaira, Nagano pref., on coniferous tree, 29-VIII-1955, R. Imazeki, (F-10894); Gotenba, Numazu, Shizuoka pref., on broad-leaved tree, 10-XI-1961, K. A. & Y. H., (F-10895); Mizugatsuka, Gotenba, Shizuoka pref., on coniferous tree, 20-X-1964, K. A., (F-11407); Hamakita, Shizuoka pref., on *Quercus* (bed logs of Shiitake mushroom), 23-IX-1969, K. A., (F-10697 ♂ Od 7b); Matsue, Shimane pref., on *Quercus*, X-1965, K. A., (F-10559); Sata, Kagoshima pref., on dead bark of broad-leaved tree, X-1962, K. A., (F-10212); Kaimon, Kagoshima pref., on broad-leaved tree, 16-X-1966, H. F., (F-11405).

Note.

Shear (1907) found an imperfect fungus which caused the root rot of cotton plant in Texas, U. S. A., and named it "*Ozonium omnivorum*". Later, Duggar (1916) found the conidial state and transferred it to the genus *Phymatotrichum*. Furthermore, Shear (1925) described *Hydnum omnivorum* Shear as a perfect state of this fungus based on a specimen produced in the same locality.

Gilbertson (1964) restudied the original specimen of *Hydnum omnivorum* Shear, and concluded that it is a different species named as *Mycoacia chrysorhiza*.

Shear cultured *H. omnivorum* and described the character of its cultured hyphae. According to his description, the conidia are formed. The writer made microscopic observations of the culture strains isolated from two or three specimens of *M. chrysorhiza* which were collected in different places, but no conidia were recognized from any of the culture strains.

Brown (1935) described cultural characteristics of this species, but he did not find conidia, and other characteristics are completely the same with that of writer's observations on examining Japanese isolate.

2) ***Mycoacia chrysella*** (**Berkeley et Curtis**) **Furukawa** comb. nov. (Fig. 39, Pl. 9, A, B)

Synonym : *Hydnum chrysella* Berk. et Curt., Grevillea, 1 : 98, 1873; Saccardo, Syll. Fung., 6 : 466, 1888; Yasuda, Bot. Mag. Tokyo, 35 : 11, 1921; Gilbertson, Mycologia, 57 : 850, 1965.

Oxydontia chrysella (Berk. et Cust.) S. Ito, Myc. Fl. Japan, 2(4) : 189, 1955.

Macroscopic characters.

Basidiocarps annual, resupinate, widely effused, readily separable from the substratum, often cracked when dry, maize yellow; Margin fibrillose to tomentose, maize yellow, sterile; Hymenial surface light buff, mikado orange or tawny; Spines brittle, cartilaginous in appearance, crowded, cylindrical, with yellowish powder at the apex, 0.1 mm diam., 1 mm long; Subiculum pale buff, 0.3～0.5 mm thick.

Microscopic characters.

Subiculum hyphae thin-walled, pale yellow under the microscope, not incrusted, frequently branched, clamp connections rarely present, 6.5～7 μ wide; Tramal hyphae thin-walled, pale yellow, branched, sometimes swollen, clamp connections not found, 3～4 μ wide; Cystidia absent; Basidia clavate, with 4 sterigmata; Basidiospores obovate, smooth, hyaline, 3～3.5×4.5 μ, non-amyloid.

Habitat : On branches and stems of dead deciduous trees, associated with a white rot.

Distribution : North America and Asia (Japan).

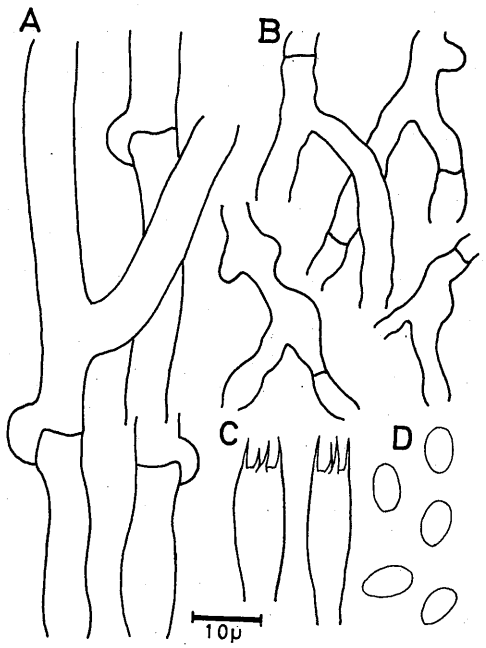

Fig. 39 Microscopic elements of *Mycoacia chrysella* (Berk. et Curt.) Furukawa (F-11198)
A : Subiculum hyphae B : Tramal hyphae
C : Basidia D : Basidiospores

Japanese name : Ki-haritake (Yasuda), Kiko-haritake (S. Ito).

Specimen examined.

Towada, Aomori pref., on broad-leaved tree, 3-IX-1966, T. K., (F-11198).

Note.

Strong yellow color of the fruit bodies when fresh and the absence of rhizomorphic strands are the diagnostic field character of this species.

3) ***Mycoacia himantia*** (**Schweinitz**) **Miller et Boyle** (Fig. 40, 41, Pl. 9, C, D, 12, E)

Univ. Iowa Stud. Nat. Hist., 18 : 44, 1943; Aoshima & Furukawa, Trans. mycol. Soc. Japan, 7(2～3) : 134, 1966.

Synonym : *Hydnum himantia* Schw., Schr. Nat. Gas. Leipzig, 1 : 104, 1822; Fries, Elench. Fung., 1 : 140, 1828, Epic., 518, 1836～1838.

Oxydontia himantia (Schw.) Miller, Mycologia, 25 : 363, 1933.

Odontia himantia (Schw.) Bres., Ann. Myc., 1 : 84, 1903; Saccardo, Syll. Fung., 17 : 156, 1905; Brown, Bot. Gaz., 96 : 665, 1935.

Kavinia himantia (Schw.) Eriksson, Symb. bot. Upsal., 16(1) : 160, 1958; Nikolajeva, Fl. Pl. Crypt. URSS 6(2) : 320, 1961.

Clavaria himantia (Schw.) Bourdot et Galzin, Hym. Fr., 123, 1927.

Hydnum subfuscum Peck, Ann. Rep. N. Y. State Mus., 40 : 53, 1887, in Gilbertson, Mycologia, 54 : 671, 1962.

Macroscopic characters.

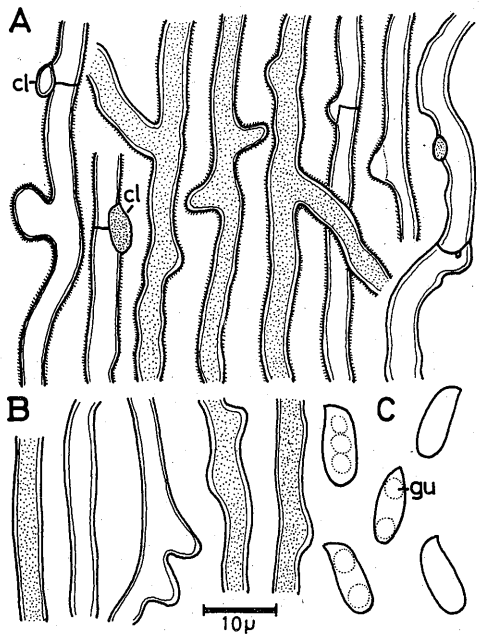

Fig. 40　Microscopic elements of *Mycoacia himantia* (Schw.) Miller (F-10217)
A : Subiculum hyphae　B : Tramal hyphae
C : Basidiospores　cl : Clamp connections
gu : Guttulate

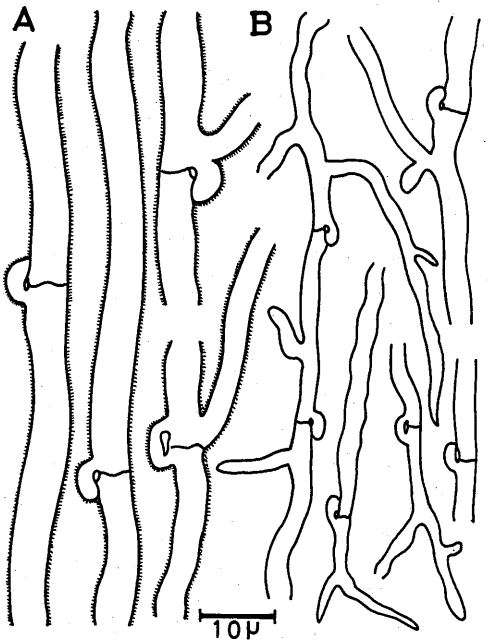

Fig. 41　Mycelial structure from a culture of *Mycoacia himantia* (Schw.) Miller (Od 2c)
A : Aerial hyphae　B : Submerged hyphae

Basidiocarps resupinate, widely effused, not easily separable from substratum, waxy, ceraceous, white at first then pinkish buff to cinnamon buff; Margin floccose, white, with rhizomorphic strands; Spines not crowded, subulate or cylindrical, pointed, 0.5～0.8 mm diam., 4～6 mm long; Subiculum floccose, white, 0.2～1.0 mm thick.

Microscopic characters.

Subiculum hyphae loosely arranged, thin-walled, faintly roughened, with numerous clamp connections, often swollen at the septa, with scattered masses of crystalline material, 2.5～4μ wide; Tramal hyphae compactly arranged, smooth, 2.5～3.5 wide; Basidia clavate, 6～8.5×25～40μ, 2～4 spored; Basidiospores cylindrical-ellipsoid, smooth, hyaline, 5×10～12μ, with 2～3 guttulate.

Cultural characters.

Growth characters : Growth very slow, forming a mat 1.2 cm in diameter in 10 days on malt agar medium, 1.7 cm in diameter in 10 days on potato glucose agar medium, white, usually thin, floccose or cottony; Margin usually thin, slightly floccose; Odorless.

Hyphal characters : Aerial hyphae thin-walled, hyaline, faintly roughened, with clamp connections, frequently branched, 2.5～4μ wide; Submerged hyphae very narrow, thin-walled, hyaline, smooth, with clamp connections, branched, 2～3μ wide.

Temperature relations : Optimum 25°C. Average mycelial mat diameters in 10 days in dark at constant temperatures follow : 1.1 cm, 20°C; 1.2 cm, 25°C; 0.1 cm, 30°C; 0 cm, 35°C on malt agar medium, 1.0 cm, 20°C; 1.7 cm, 25°C; 0.2 cm, 30°C; 0 cm, 35°C on potato glucose agar medium.

Habitat : On fallen branches of deciduous trees, associated with a white rot.

Distribution : Europe, North America and Asia (Japan, USSR).

Japanese name : Usucha-sagari-haritake (Aoshima & Furukawa).

Specimens examined.

Masukawa, Aomori pref., on deciduous tree. VIII-1957, K. A., (F-10217); Otoineppu, Hokkaido, on deciduous tree, 7-IX-1969, K. A., Y. H. & H. F., (F-11401 ♂ Od 2c); Numanohara, Soounkyo, Hokkaido, on broad-leaved tree, 11-IX-1969, H. F. & Y. H., (F-11399, F-11400); Shikotsu, Hokkaido, on dead broad-leaved tree, 10-VIII-1963, K. A., Y. H. & T. K., (F-10902, F-10903, F-10233, F-10234, F-10235); Tomakomai, Hokkaido, on broad-leaved tree, 21-IX-1962, Y. H., (F-10561); Sapporo, Hokkaido, on broad-leaved tree, 15-IX-1948, R. Imazeki, (F-10896); Nopporo, Hokkaido, on broad-leaved tree, 4-IX-1948, K. A., (F-10897); Ooshika, Shimoina, Nagano pref., on broad-leaved tree, X-1948, K. A., (F-10898, F-10899); Shimokawane, Shizuoka pref., on broad-leaved tree, 25-VIII-1949, K. A., (F-10900, F-10901).

Note.

As the genus of this species, Eriksson (1958) adopted *Kavinia* Pilát of Clavariaceae (Type species : *Caldesiella sajanansis* Pilát), and Nikolajeva (1961) accepted this treatment. However, just as pointed out by Corner (1950), this species has spines of geophilous property and spines are hydnoid. Therefore, it should not be placed in the familie Clavariaceae.

4) ***Mycoacia copelandii*** **(Patouillard) Aoshima & Furukawa** (Fig. 42, 43, Pl. 9, E, F, 12, F)

Trans. mycol. Soc. Japan, 7(2～3) : 136, 1966.

Synonym : *Hydnum copelandii* Pat., Leafl. Philipp. Bot., 6 : 2251, 1914; Saccardo, Syll. Fung., 23 : 474, 1925; Yasuda, Bot. Mag. Tokyo, 34 : 213, 1920.

Oxydontia copelandii (Pat.) S. Ito, My. Fl. Japan, 2(4) : 189, 1955.

Sarcodontia copelandii (Pat.) Imazeki, Col. Illust. Fungi Japan, 2 : 127, 1965.

Macroscopic characters.

Basidiocarps resupinate, irregularly and widely effused, not easily separable from substratum, thin, waxy, fleshy to soft-coriaceous, hard-coriaceous when dry, white at first, then light ochraceous buff to pinkish cinnamon; Margin thin, tomentose or floccose, white at first, then light ochraceous, sterile; Spines crowded, slender, subulate or cylindrical, pointed, ochraceous -tawny to russet when dry, 1 mm diam., 5～10 mm long; Subiculum thin, fleshy to ceraceous, white to light ochraceous buff, 1 mm thick.

Microscopic characters.

Subiculum hyphae loosely arranged, thin-walled, sometimes branched, with clamp connections, often slightly incrusted, 3～5μ wide; Tramal hyphae thin-walled, often branched, with clamp connections, 2.5～3μ wide; Basidia clavate, 4-spored, 5～7×12～15μ; Basidiospores globose, smooth, hyaline, 5～6×6μ, with 2～3 guttulate.

Cultural characters.

Growth characters : Growth slow, forming a mycelial mat 2.8 cm in diameter in 10 days on malt agar medium, 1.7 cm in diameter in 10 days on potato glucose agar medium, white, floccose or faintly pruinose; Margin thin, slightly floccose, even; Odorless.

Hyphal characters : Aerial hyphae thin-walled, hyaline, surface smooth, with clamp connections, sometimes branched, 3～5μ wide; Submerged hyphae thin-walled, hyaline, surface smooth, with clamp connections, 2～3μ wide.

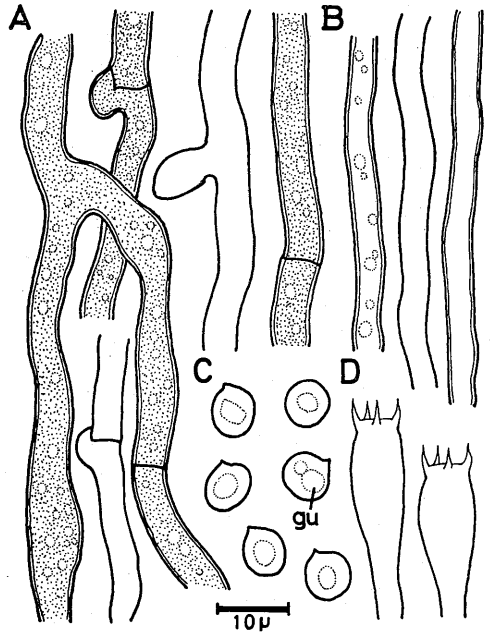

Fig. 42 Microscopic elements of *Mycoacia copelandii* (Pat.) Aoshima et Furukawa (F-10038)
A : Subiculum hyphae B : Tramal hyphae
C : Basidiospores D : Basidia
gu : Guttulate

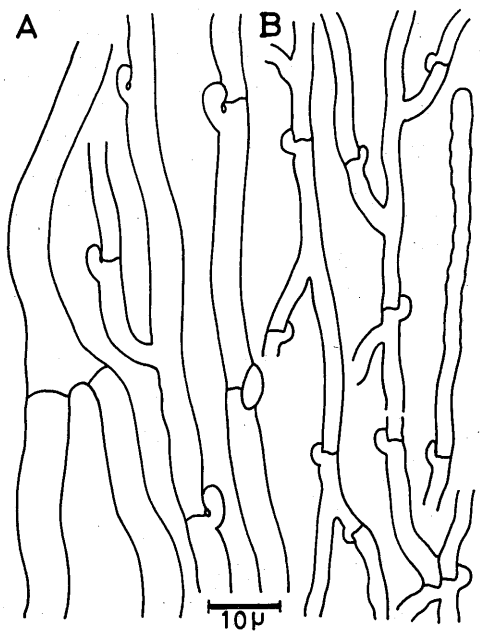

Fig. 43 Mycelial structure from a culture of *Mycoacia copelandii* (Pat.) Aoshima et Furukawa (Od 6a)
A : Aerial hyphae B : Submerged hyphae

Temperature relations : Optimum approximately 25°C. Average mycelial mat diameters in 10 days in dark at constant temperatures follow : 2.4 cm, 20°C; 2.8 cm, 25°C; 2.0 cm, 30°C; trace, 35°C on malt agar medium, 2.0 cm, 20°C; 1.7 cm, 25°C; 0.9 cm, 30°C; trace, 35°C on potato glucose agar medium.

Habitat : On deciduous trees, associated with a white rot.

Japanese name : Sagari-haritake (Yasuda).

Distribution : Asia (Philippines and Japan).

Specimens examined.

Otoineppu, Hokkaido, on *Quercus*, 7-IX-1969, K. A., Y. H. & H. F., (F-11411); Tomakomai, Hokkaido, on *Quercus*, 19-IX-1962, Y. H., (F-11408); Sapporo, Hokkaido, on *Quercus*, 8-VIII-1963, S. Kamei, (F-10292); Tsuchiyu, Fukushima pref., on *Quercus*, 20-X-1949, K. A., (F-10886); Kiyosumi, Chiba pref., on hardwood, 1-X-1961, K. A., Y. H. & H. F., (F-10038 ♂ Od 6a); Matsunoyama, Niigata pref., on *Quercus*, 13-IX-1964, K. A. & Y. H., (F-10890, F-10891); Meguro, Tokyo, on *Ostruya*, VI-1960, K. A., (F-10039); Hikawa, Nishitama, Tokyo, on *Quercus*, 26-V-1962, Y. H. & H. F., (F-10888); Kawane, Shizuoka pref., on *Quercus*, VIII-1949, K. A., (F-10885); Motosu, Yamanashi pref., on dead broad-leaved tree, 28-IV-1948, T. Nukumizu, (F-10290); 2-gome, Fuji, Yamanashi pref., on broad-leaved tree, 6-X-1964, H. F. & T. K., (F-10463); Nobeyama, Nagano pref., on *Quercus*, 25-IX-1961, H. F., (F-10291); Agematsu, Nagano pref., on *Quercus*, 29-XI-1961, Y. H. & H. F., (F-10887); Kaida, Nagano pref., 3-IX-1963, Y. H. & H. F., (F-10889); 5-gome, Ontake, Nagano pref., on *Quercus*, 5-IX-1963, Y. H. & H. F., (F-10134); Aoidake, Miya-

zaki pref., on dead broad-leaved tree, 9-XI-1967, H. F., (F-11409); Hetsuka, Uchinoura, Kagoshima pref., on dead broad-leaved tree, 15-X-1963, K. A. & H. F., (F-10214, F-10215, F-10216).

Note.

Since its description as *Hydnum copelandii* by PATOUILLARD (1914), this fungus was firstly evaluated and reported by LLOYD (1920) on HEMMI's specimen collected in Japan.

YASUDA (1920) reported this species giving the Japanese name of Sagari-haritake. Later, S. ITO (1955) transferred it to the genus *Oxydontia*. AOSHIMA (1966a) examined the original specimens in both PATOUILLARD herb. and LLOYD herb. microscopically, and successfully observed a good number of mature spores in both the specimens. As a result it was confirmed that the Japanese specimens has been correctly identified by LLOYD and YASUDA. AOSHIMA & FURUKAWA (1966a) judged it reasonable to place this fungus in the genus *Mycoacia* based on the fact that the hyphae which consist the subiculum are entirely thin-walled.

3. ***Dentipellis*** **DONK emend FURUKAWA**

Persoonia 2(2) : 232, 1962.

Synonym : *Hericium* subsect, *Fragilia* NIKOLAJEVA, Fl. Pl. Crypt. URSS 6(2) : 234, 1961.

Basidiocarps resupinate, rarely effuse-reflexed, more or less separable, consisting of a membraneous, soft basal layer from which the spines develop; Spines often long, slender, rather densely crowded, fragile; Subiculum non-amyloid; Hyphae with clamp connections; Gloeocystidia present; Basidia clavate, with 2～4 sterigmata; Basidiospores globose, broadly ovoid or short-ellipsoid, small, walls smooth or echinulate, amyloid.

Type species : *Hydnum fragile* PERS. ex FR.

Family : Hydnaceae.

Japanese name : Hanare-haritake-zoku (FURUKAWA).

Species in Japan : *D. macrodon* (PERS. ex FR.) FURUKAWA, *D. echinospora* FURUKAWA.

Note.

A newly found species, *D. echinospora* FURUKAWA has echinulate basidiospores, although other characters are completely the same with those of all the species included in the genus *Dentipellis*.

The writer revised the concepts of the genus adding echinulate characters of spores.

The presence of gloeocystidia and amyloid spores is the diagnostic characters for the genus.

Key to Japanese species of *Dentipellis*

A 1 : Spore smooth, broadly ellipsoid, 3.5～4.5×5～6 μ.....*D. macrodon* (1)

A 2 : Spore minutely echinulate, ovoid, 4×5 μ.....*D. echinospora* (2)

1) ***Dentipellis macrodon*** **(PERSOON ex FRIES) FURUKAWA** comb. nov. (Fig. 44, Pl. 9, G, H)

Synonym : *Hydnum macrodon* PERSOON ex FRIES, Syst. Myc., 1 : 415, 1821.

Oxydontia macrodon (PERS. ex FR.) MILLER, Mycologia, 25 : 365, 1933.

Odontia separans, TERAMOTO, Bull. Tokyo Univ. Fores. 37 : 365, 1949.

Macroscopic characters.

Basidiocarps annual, soft, membranaceous, separable, effused, at first small, orbicular patches, 1～2 cm in diam., later up to 7×4 cm; Hymenial surface light buff when fresh, light buff to ochraceous buff when dry; Margin finely tomentose, light buff, up to 1 mm wide; Spines crowded, subulate, free or united at the base, breaking easily, 0.3～0.4 mm diam., 0.5～0.7 cm

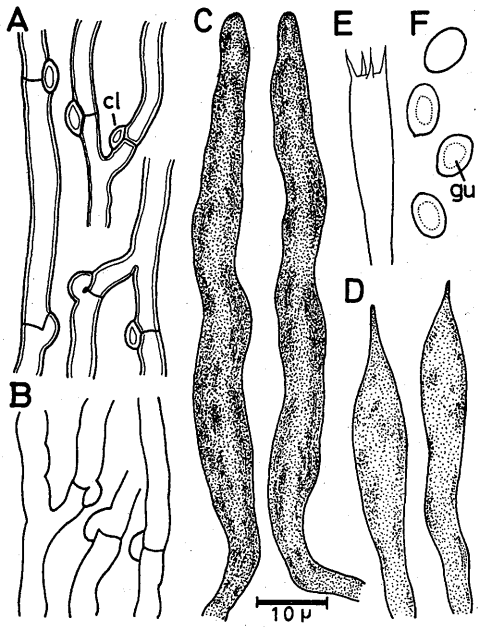

Fig. 44 Microscopic elements of *Dentipellis macrodon* (Pers. ex Fr.) Furukawa (F-11276)
A : Subiculum hyphae B : Tramal hyphae
C, D : Gloeocystidia E : Basidia
F : Basidiospores cl : Clamp connections
gu : Guttulate

long; Subiculum very thin, soft, light buff.

Microscopic characters.

Subiculum hyphae rather loosely arranged, hyaline, made of two types of hyphae, the one faintly thick-walled, branched, with clamp connections, 2～5μ wide, this gives rise to dark greenish imbedded gloeocystidium which is 4～7μ wide, 40～80μ long, aseptate, sometimes with constrictions, and often ending in a clavate or lanceolate tip, the other thin-walled, branched, with clamp connections, 2.5～3.5μ wide; Basidia clavate, 5×15～20μ, sterigmata 5μ long; Basidiospores broadly ellipsoid, smooth, hyaline, 3.5～4.5×5～6μ, amyloid.

Habitat : Growing on woods of broad-leaved trees, associated with a white rot.

Japanese name : Hanare-haritake (Furukawa).

Distribution : Europe, North America and Asia (Japan).

Specimens examined.

Kiryu, Gunma pref., on *Quercus* (bed logs of Shiitake mushroom), 4-VIII-1964, H. F., (F-11276); Hamakita, Shizuoka pref., on *Quercus* (bed logs of Shiitake mushroom), X-1969, H. F., (F-11277).

Note.

Although this species resembles macroscopically the species of *Mycoacia* and *Creolophus*, microscopically it is quite different in that this species has gloeocystidia and amyloid spores.

2) ***Dentipellis echinospora*** **Furukawa** sp. nov. (Fig. 45, Pl. 10, A, B)

Basidiocarpus annuum, effusum, resupinatum, lenis, membranaceum, facile separabile; Hymenium pallide luteum vel ochraceum luteum; Margo tomentosus, cremea; Spinae subuliformis, coactus, 0.3～0.4 mm diam., 0.5～1 mm longae; Subiculum admodum tenuis; Subiculum hyphae subcrassitunicatus, paniculatus, abundance nodoso-septata, 2.5～5μ diam.; Gloeocystidia cooperatus, atra viridulum, 5～7.5×50～80μ; Basidia clavata, 5×20～25μ; Sporae subglobosus vel ovoideus, minute echinulatus, hyalinus, 4×5μ, amyloideus.

Macroscopic characters.

Basidiocarpus annual, resupinate, rarely effuse-reflexed, soft, membranaceus, easily separable; Hymenial surface light buff when fresh, light buff to ochraceous buff when dry; Margin finely tomentose, white to light buff; Spines very crowded, subulate, tapering to the tip, free or united at the base, the apices smooth, fragile, 0.3～0.4 mm diam., 0.5～1.0 cm long; Subiculum very thin, soft, light buff.

Microscopic characters.

Subiculum hyphae loosely arranged, made of two types of hyphae, the one faintly thick-

walled, branched, with clamp connections, 2.5～5μ wide, the other thin-walled, branched, with clamp connections, 2.5～4μ wide; Gloeocystidia imbedded, dark greenish in 5% KOH solution, sometimes with constrictions, and often ending in a clavate or lanceolate tip, 5～7.5×50～80μ; Basidia clavate, 5×20～25μ, 4-spored, sterigmata 5μ long; Basidiospores subglobose to ovoid, minutely echinulate, hyaline, 4×5μ, amyloid.

Habitat : Growing on broad-leaved trees, associated with a white rot.

Japanese name : Hanare-haritake-modoki (Furukawa).

Distribution : Asia (Japan).

Specimens examined.

Masutomi, Yamanashi pref., 30-VIII-1969, K. A. & T. K., (F-10947 Type); Chichibu, Saitama pref., on *Quercus*, 11-XI-1967, K. A., Y. H. & T. K., (F-11397); Marunuma lakeside forests, Gunma pref., 27-V-1970, A. Kanematsu, (F-11398).

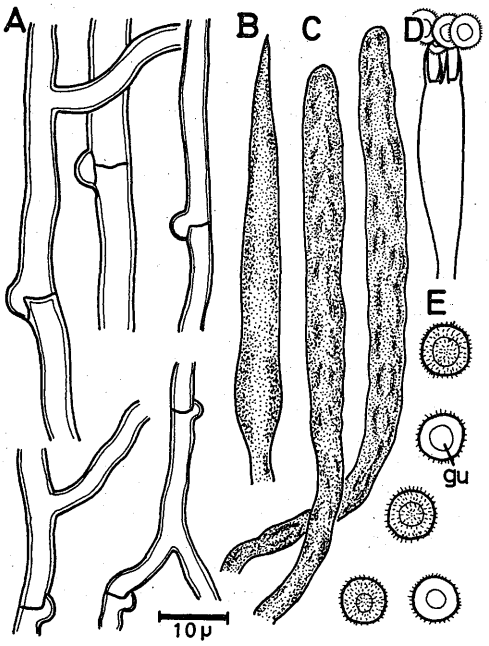

Fig. 45 Microscopic elements of *Dentipellis echinospora* Furukawa (F-10947)
A : Subiculum hyphae B, C : Gloeocystidia
D : Basidia and Basidiospores
E : Basidiospores gu : Guttulate

Note.

With an exception of basidiospore character, all other characteristics of this species are perfectly the same as those of *D. separans*. Basidiospores of this species are minutely echinulate.

By careful microscopic observations of three specimens the writer observed that young spores attached to basidia were also minutely echinulate. Basidiospores look smooth in KOH solution, however in Melzer's reagent they turn to purple and the echinulations are clearly detected.

Gilbertson (1962) examined the original specimen of *H. separans* Pack and stated that "basidia and basidiospores not seen; ……; small, subglobose to ovoid, minutely rough spores of a hyphomycete present, these 3.5～4×4～5μ".

4. ***Basidioradulum*** **Nobles**

Mycologia, 59 : 192, 1967.

Synonym : *Radulum* of many authors, not Fries, Elench. Fung., 1 : 148, 1828.

Basidiocarps annual, resupinate, effused, ceraceous; Hymenial surface hydnoid, waxy; Subiculum hyphae thin-walled, with clamp connections; Basidiospores cylindrical, non-amyloid; Cultures producing extra-cellular oxidase and showing the tetrapolar type of interfertility.

Type : *Hydnum radula* (Fr.) Fries.

Family : Hydnaceae.

Japanese name : Okubatake-zoku.

Species in Japan : *B. radula* (Fr. ex Fr.) Nobles; *B. pallidum* (Berk. et Curt.) Furukawa; *B. casearium* (Morgan) Furukawa; *B. quercinum* (Fr.) Furukawa; *B. molare* (Fr.) Furukawa.

Note.

Selected type species of the genus *Radulum* was identified by DONK as an Ascomycetes fungus, *Eutypa hydnoidea* (FR.) HÖHN. (Sphaeriales, Ascomycetes). Then NOBLES (1967) established the genus *Basidioradulum* designating *Hydnum radulum* (FR.) FR. as type species.

Key to Japanese species of *Basidioradulum*

A 1 : Margin slightly reflexed.

B 1 : Basidiocarps pinkish buff, spores ellipsoid, obliquely attenuated, 3.5～4×7μ ..... *B. pallidum* (1)

A 2 : Resupinate.

B 1 : Teeth separate.

C 1 : Basidiocarps light yellowish brown, spores cylindrical, flattened on one side, 4～5×8.5～11μ ..... *B. radula* (2)

C 2 : Basidiocarps ochraceous buff, spores subglobose, 2～3×3.4～4μ ..... *B. molare* (3)

C 3 : Basidiocarps cinnamon buff, spores ellipsoid, 3～4×6～7μ ..... *B. quercinum* (4)

B 2 : Teeth coalesce.

C 1 : Basidiocarps antimony yellow, spores globose, 5×6μ ..... *B. casearium* (5)

1) ***Basidioradulum pallidum*** (**BERKELEY et CURTIS**) **FURUKAWA** comb. nov. (Fig. 46, 47, Pl. 10, C, D, 12, G)

Synonym : *Radulum pallidum* BERK. et CURT., Grevillea, 1 : 145, 1873; SACCARDO, Syll. Fung., 6 : 496, 1888; LLOYD, Myc. writ., 5, The genus *Radulum*, 2, 1917; MILLER, Mycologia, 26 : 214, 1934; NIKOLAJEVA, Fl. Pl. Crypt. URSS 6(2) : 93, 1961.

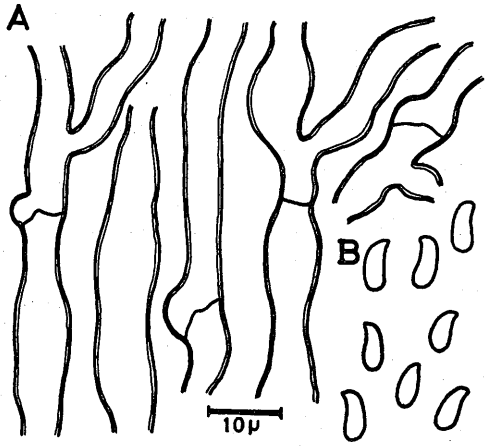

Fig. 46 Microscopic elements of *Basidioradulum pallidum* (BERK. et CURT.) FURUKAWA (F-10036)
A : Subiculum hyphae　B : Basidiospores

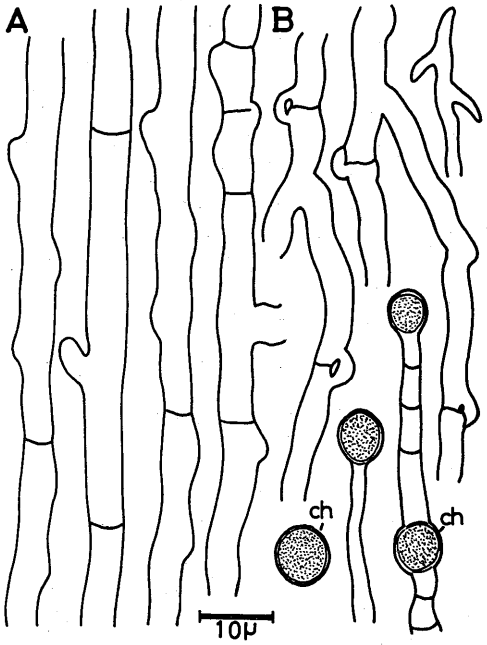

Fig. 47 Mycelial structure from a culture of *Basidioradulum pallidum* (BERK. et CURT.) FURUKAWA (Od 15a)
A : Aerial hyphae　B : Submerged hyphae
ch : Chlamydospores

Macroscopic characters.

Basidiocarps resupinate to narrowly reflexed, tomentose, orbicular at first, then confluent and slightly effused, adnate, ceraceous, thick, usually not cracking, pinkish buff to vinaceous buff or vinaceous fawn; Margin tomentose, white; Teeth variable, short, obtuse, smooth or slightly fimbriate, often confluent in irregular groups; Subiculum waxy, pinkish buff.

Microscopic characters.

Subiculum hyphae distinct, thin-walled, with numerous clamp connections, more or less parallel along the substratum and ascending obliquely to the compact hymenium, hyaline or granular, 3～5μ wide; Basidiospores ellipsoid, obliquely attenuated, slightly depressed laterally, smooth, hyaline, 3.5～4×7μ.

Cultural characters.

Growth characters : Growth medium, forming a mycelial mat 4.0 cm in diameter in 10 days on malt agar medium, 6.1 cm in diameter in 10 days on potato glucose agar medium, white, floccose; Margin thin, floccose; Odorless.

Hyphal characters : Aerial hyphae thin-walled, walls surface smooth, without clamp connections, branched, sometimes swells to knob-like body, 4～5μ wide; Submerged hyphae very narrow, thin-walled, surface smooth, with clamp connections, branched, sometimes swells to knob-like body, 2～3μ wide; Chlamydospores usually abundaut, very thick-walled, globose, 8～13μ diam.

Temperature relations : Optimum 25°C. Average diameters of mycelial mat in 10 days in the dark at constant temperatures follow : 3.9 cm, 20°C; 4.0 cm, 25°C; 3.0 cm, 30°C; 0.5 cm, 35°C on malt agar medium, 4.9 cm, 20°C; 6.1 cm, 25°C; 5.9 cm, 30°C; 2.0 cm, 35°C on potato glucose agar medium.

Habitat : On decaying woods and barks of deciduous trees, associated with a white rot.

Japanese name : Ameiro-okubatake (Furukawa).

Distribution : North America and Asia (Japan, USSR).

Specimens examined.

Soounkyo, Hokkaido, on *Populus*, IX-1959, K. A., (F-10036); Meguro, Tokyo, on *Quercus*, 16-VII-1964, H. F., (F-11285), on *Quercus*, 1-VII-1964, H. F., (F-10910), on *Quercus*, 25-VII-1951, K. A., (F-11283); Tama lakeside forests, Tokyo, on *Quercus*, 15-VII-1965, H. F., (F-11284); Masutomi, Yamanashi pref., on hardwood, 30-VIII-1965, K. A. & T. K., (F-11286); Wada, Nagano pref., on *Quercus*, 1-VIII-1965, K. A., Y. H. & H. F., (F-10997 ♂ Od 15a); Hirai, Kozagawa, Wakayama pref., on *Quercus*, 30-VII-1967, H. F., (F-11040, F-11282); Uchizume, Hetsuka, Kagoshima pref., on *Pasania* sp., 6-VI-1962, H. F., (F-10909, F-11279, F-11230).

Note.

This species resembles *B. quercinum* (Fr.) Furukawa. It seems to differ in its often reflexed margin, the abundance of clamp connections in subiculum hyphae and slightly smaller spores.

2) ***Basidioradulum radula*** (**Fries ex Fries**) **Nobles** (Fig. 48, Pl. 10, E, F)

Mycologia, 59 : 192, 1967.

Synonym : *Hydnum radula* Fries, Obs., 2 : 271, 1815, Syst. Myc., 1 : 422, 1821, Syst. Orb. Veg., 1 : 81, 1825.

Sistotrema radula (Fr. ex Fr.) Persoon, Myc. Eur., 2 : 195, 1825.

Radulum radula (Fr. ex Fr.) Nannfeldt, in Lumdell & Nannfeldt, Fung. Exs. Sues. Fasc., 3～4, No. 160, 1935.

Hyphoderma radula (Fr. ex Fr.) Donk, Fungus, 27 : 15, 1957; Eriksson, Symb. Bot. Upsal., 16(1) : 96, 1958; Christiansen, Dansk Bot. Arkiv, 19(2) : 201, 1960.

Radulum orbiculare Fr., Syst. Orb. Veg., 1 : 81, 1825, Elench., 1 : 149, 1828, Epic,, 524, 1836～1838, Hym. Eur., 623, 1874; Schweinitz, Trans. Am. Phil. Soc. n. s. 4 : 164, 1834; Berkeley, Out. Br. fung, 263, 1860; Karsten, Myc. Fenn., 3 : 299, 1876; Peck. Rept. N. Y. State Mus., 30 : 47, 1878; Quélet, Ench. Fung., 199, 1886; Kalchbrenner, Grev., 19 : 57, 1881; Brefeld, Myk., 8 : 30, 1889; Saccardo, Syll. Fung., 6 : 493, 1888; Lloyd, Myc. Writ., 5 : 3, 1917; Rea, Brit. Basid., 640, 1922; Bourdot & Galzin, Hym. Fr., 404, 1927; Miller, Mycologia, 26 : 212, 1934; Miller & Boyle, Univ. Iowa Stud., 18 : 18, 1943; Teramoto, Bull. Tokyo Univ. Forests, 37 : 108, 1949; Boidin, Rev. Myc. Mém. Hors-série no. 6, 1958; Nikolajeva, Fl. Pl. Crypt. URSS 6(2) : 81, 1961.

Radulum bennettii Berk. et Curt., Grev., 2 : 3, 1873, in Gilbertson, Mycologia, 57 : 849, 1965.

Macroscopic characters.

Basidiocarps resupinate, orbicular at first, remaining discrete or coalescing, soft ceraceous when fresh, ceraceous when dry, white to light yellowish brown or strong yellowish brown, sometimes cracked; Margin distinct, white to light yellowish brown, fimbriate; Teeth crowded, isolated or fascicled, variable, conical to cylindrical or plate-like, obtuse, the tips usually remaining white and floccose, 1～1.5 mm long; Subiculum ceraceous, white to light yellowish brown, 0.2～0.8 mm thick.

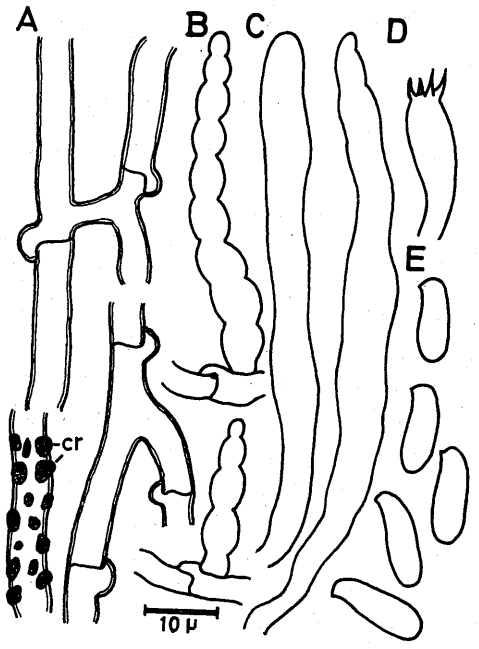

Fig. 48 Microscopic elements of *Basidioradulum radula* (Fr. ex Fr.) Nobles (F-10908)
A : Subiculum hyphae　B : Moniliform hyphae　C : Gloeocystidia like hyphae
D : Basidia　E : Basidiospores
cr : Crystals on the surface of mycelia

Microscopic characters.

Subiculum hyphae loosely arranged, thin-walled, with clamp connections, often slightly incrustly, with frequently H-anastomoses, 2～4μ wide; Gloeocystidia like hyphae thin-walled, with homogeneous contents staining in phloxine, negative with sulfuric benzaldehyde, indistinguishable from immature basidia, clavate or cylindrical, frequently with constrictions, flexuous, rarely projecting, 5～7.5×20～60μ; moniliform terminal cell observed only on vegetative hyphae in subiculum near the substratum, slender, tapering, flexuous, the contents often plasmolyzed and then staining vivid pink in phloxine, 3.5～5μ diam., 35～65μ long; Basidia clavate, 4.5～5×20～30μ, 4-spored, sterigmata 3.5μ long; Basidiospores cylindrical, flattened on one side, sometimes slightly curved, smooth, hyaline, 4～5×8.5～11μ, non-amyloid.

Habitat : Growing on barks of dead broad-leaved and coniferous trees, associated with a white rot.

Japanese name : Uroko-okubatake (Furukawa).

Distribution : Europe, North America and Asia (Japan, USSR).

Specimens examined.

Seta, Gunma pref., on bark of dead broad-leaved tree, X-1962, N. NISHIDA, (F-10908); Otoineppu, Hokkaido, on bark of dead broad-leaved tree, 7-IX-1969, K. A., Y. H. & H. F., (F-11273) : Numanohara, Soounkyo, Hokkaido, on bark of dead *Quercus*, 11-IX-1969, Y. H. & H. F., (F-11272); Nisecharo, Soounkyo, Hokkaido, on bark of dead broad-leaved tree, 12-IX-1969, Y. H. & H. F., (F-11271); Yamabe, Hokkaido, on bark of dead broad-leaved tree, 16-VIII-1963, K. A., Y. H. & T. K., (F-11270); Nobeyama, Nagano pref., on hard wood, 11-XI-1961, K. A. & Y. H., (F-10905, F-10906, F-10907); Kaida, Nishichikuma, Nagano pref., on bark of dead *Quercus*, 3-IX-1963, Y. H. & H. F., (F-11212); Ashu, Kyoto pref,. on bark of dead *Quercus*, VII-1964, H. F. & T. K., (F-11274).

Note.

Owing to the recent studies made by NOBLES (1967), the characters of this species were elucidated.

This species is abundantly found in Japan on wood or bark of deciduous and coniferous species.

3) ***Basidioradulum molare*** (**FRIES**) **FURUKAWA** comb. nov. (Fig. 49, Pl. 10, G, H)

Synonym : *Radulum morale* FR., Elench. Fung., 1 : 151, 1828, Epic. Myc., 525, 1836～1838, Hym. Eur., 623, 1874; SACCARDO, Syll. Fung., 6 : 494, 1888; YASUDA, Bot. Mag. Tokyo, 29 : 295, 1915; LLOYD, Myc. Writ., 5, Gen. *Radulum*, 6, 1917; IMAZEKI, Nippon Inkashokubutsu Zukan, 419, 1938; S. ITO, Fl. Myc. Japan, 2(4) : 188, 1955.

Macroscopic characters.

Basidiocarps resupinate, thin, closely adnate, widely effused, cartilaginous, white to light ochraceous buff or ochraceous buff; Margin distinct, white, fimbriate; Teeth crowded, amber or brown, variable, subulate, cylindrical, obtuse, scattered or fascicled, 0.2～0.3 mm diam., 1～3 mm long; Subiculum soft, waxy when fresh, hard when dry, white to light ochraceous buff, 0.6～1.0 mm thick.

Microscopic characters.

Subiculum hyphae agglutinated, thin-walled, with branches and clamp connections, 2.5～4μ wide; Tramal hyphae compactly arranged, thin-walled, not branched, clamp connections not seen, 2.5～3μ wide; Basidia clavate, 6～7×25μ, 4-spored; Basidiospores subglobose, smooth, hyaline, 2～3×3.5～4μ, non-amyloid, with one guttulate.

Habitat : Growing on bark of branches of dead broad-leaved trees, associated with

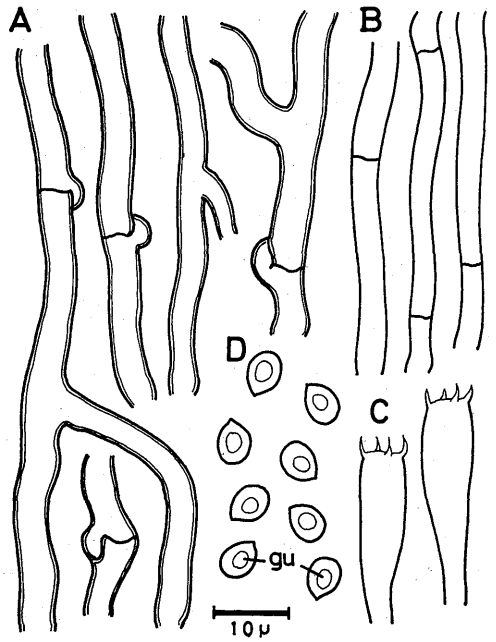

Fig. 49 Microscopic elements of *Basidioradulum molare* (FR.) FURUKAWA (F-10821)
A : Subiculum hyphae B : Tramal hyphae
C : Basidia D : Basidiospores
gu : Guttulate

a white rot.

Japanese name : Okubatake (YASUDA).

Distribution : Europe and Asia (Japan).

Specimens examined.

Kawakami, Misugi, Mie pref., on bark of *Quercus*, 7-IX-1965, K. A., Y. H. & H. F., (F-10821); Aoshima, Miyazaki pref., on bark of dead *Quercus*, VII-1962, K. A., (F-11275).

Note.

Amber to brown sporophores, large and cylindrical teeth, and smaller spores are the characteristic features for this species.

4) ***Basidioradulum quercinum*** (**FRIES**) **FURUKAWA** comb. nov. (Fig. 50, Pl. 11, A, B)

Synonym : *Hydnum quercinum* FRIES, Syst. Myc., 1 : 423, 1821.

Radulum quercinum (FR.) FRIES, Hym. Eur., 623, 1874; WEINMANN, Hym., 369, 1836; SACCARDO, Syll. Fung., 6 : 494, 1888; SCHROETER, Pilze v. Schl., 452, 1889; BRESADOLA, Fungi kmet., 103, 1897, Fungi Polen., 89, 1903; HERTER, Pilze, 175, 1910; Migula, Pilze, II, 194, 1912; LLOYD, Myc. Writ., 5, The genus *Radulum*, 6, 1917; KILLERMANN, Pilze aus Bayern, 1 : 51, 1922; REA, Brit. Basid., 640, 1922; BOURDOT & GALZIN, Hym. Fr., 243, 1927; CEJP, Hydn. Čskosl., 72, 1928; MILLER, Mycologia, 26 : 213, 1934; NIKOLAJEVA, Fl. Pl. Crypt. URSS 6(2) : 89, 1961.

Hyphodontia quercinum (FR.) ERIKSSON, Symb. Bot. Upsal., 16(1) : 105, 1958; CHRISTIANSEN, Dansk Bot. Arkiv, 19(2) : 224, 1960.

Hydnum fagineum PERSOON ex FRIES, Syst. Myc., 1 : 433, 1821.

Macroscopic characters.

Basidiocarps resupinate, adnate, orbicular then confluent and widely effused, sometimes subdecorticating, crustaceous-ceraceous, often cracked in drying, pale reddish to cinnamon buff; Margin thin, slightly villose; Teeth scattered, variable in shape, conical to cylindrical, obtuse to slightly pointed, up to 1 mm long; Subiculum thin, waxy, cream, 0.2～0.3 mm thick.

Microscopic characters.

Subiculum hyphae thin-walled, with clamp connections, frepuently branched, 3.5～5μ wide; Cystidioles slightly fusoid, thin-walled, 3～5μ wide, projecting 7～10μ long; Basidia clavate, with 2～4 sterigmata, 5×12～18μ; Basidiospores ellipsoid to short cylindrical, slightly curved, smooth, hyaline, 3～4×6～7μ.

Habitat : On bark of branches, and stems of dead broad-leaved trees, associated with a white rot.

Japanese name : Aka-okubatake (FURUKAWA).

Distribution : Europe, North America and Asia (Japan, USSR).

Specimens examined.

2-gome, Fuji, Yamanashi pref., on dead bark of *Quercus*, 6-X-1964, H. F., (F-11211); Oosugi-dani, Mie pref., on bark of *Quercus*, 11-IX-1965, K. A., Y. H. & H. F., (F-10822); Sendai, Miyagi pref., on bark of *Quercus* (bed log of Shiitake mushroom), X-1965, S. SATO, (F-11278).

Note.

Reddish brown sporophores and rarely clamped subiculum hyphae are the characteristic features for this species.

It is very rarely found in Japan.

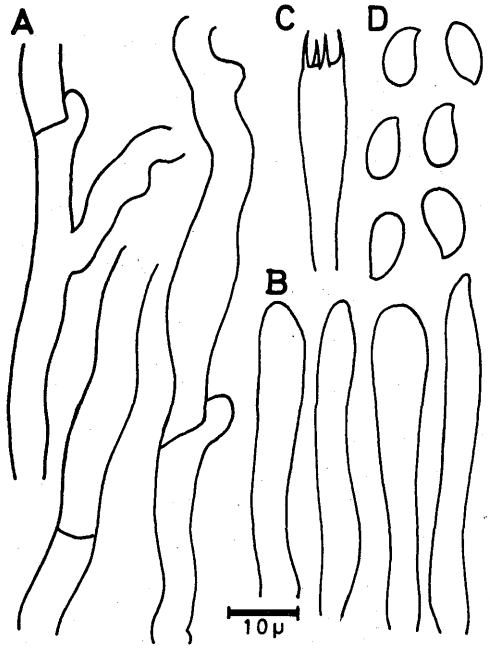

Fig. 50 Microscopic elements of *Basidioradulum quercinum* (Fr.) Furukawa (F-11211)
A : Subiculum hyphae B : Cystidiole
C : Basidia D : Basidiospores

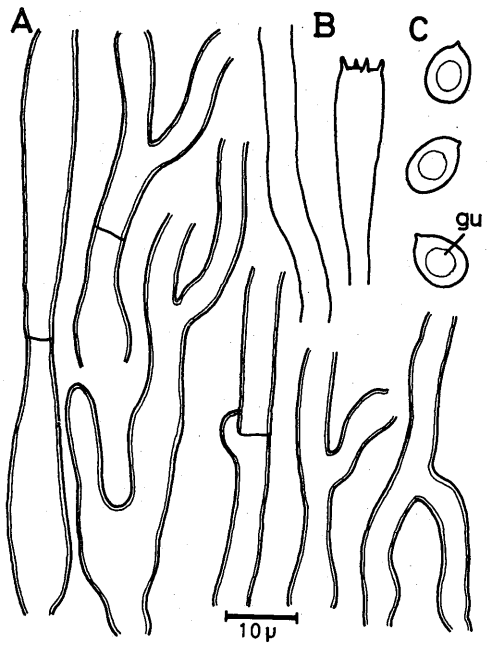

Fig. 51 Microscopic elements of *Basidioradulum casearium* (Morgan) Furukawa (F-10904)
A : Subiculum hyphae B : Basidia
C : Basidiospores gu : Guttulate

5) ***Basidioradulum casearium*** (**Morgan**) **Furukawa** comb. nov. (Fig. 51, Pl. 11, C, D)

Synonym : *Hydnum casearium* Morgan, Miami, Myc., III.

Radulum casearium (Morgan) Lloyd, Myc. Writ., 5, The genus *Radulum*, 8, 1917 ; Nikolajeva, Fl. Pl. Crypt. URSS 6(2) : 96, 1961 ; Gilbertson, Pap. Mich. Acad. Sci. Arts Lett., 49 : 21, 1964.

Macroscopic characters.

Basidiocarps resupinate, widely effused, thin, adnate, ceraceous to cartilaginous, not cracked, antimony yellow to brown when dry ; Margin not distinct, irregular ; Teeth crowded, agglutinated, subulate or cylindrical, pointed, 0.3～0.4 mm diam., 1～2.5 mm long ; Subiculum thin, ceraceous, antimony yellow, 0.2～0.3 mm thick.

Microscopic characters.

Subiculum hyphae agglutinated, not distinct, mostly thin-walled, clamp connections rare, frequently branched, 2～5μ wide ; Cystidia none, but a few slender, hyaline, projecting hyphae from ends of teeth ; Basidia cylindrical, 4-spored, 5～8×17～25μ, Basidiospores globose or subglobose, smooth, hyaline, 5×6μ, with one guttulate.

Habitat : On barks and stems of dead broad-leaved trees, associated with a white rot.

Japanese name : Kicha-okubatake (Furukawa).

Distribution : North America, Europe and Asia (Japan).

Specimen examined.

Oguni, Yamagata pref., on stem of dead broad-leaved tree, 20-X-1950, K. A., (F-10904).

Note.

The concepts of this species are those of Gilbertson (1964).

5. ***Laeticorticinm* DONK**

Fungus, 26 : 16, 1956; ERIKSSON, Symb. Bot. Upsal., 16(1) : 73, 1958; CHRISTIANSEN, Dansk Bot. Arkiv, 19 : 112, 1960; AOSHIMA & FURUKAWA, Trans. mycol. Soc. Japan, 7(2～3) : 148, 1966.

Basidiocarps resupinate, effused, thin, membraneous, pale but vividly colored when fresh; Subiculum usually fibrillose to subfloccose, hyphae distinct, not tough, thin and thick-walled, with clamp connections; Hymenial layer thin, with antler-like hyphidia abundantly, these very narrow, less than 2μ wide, and imbedded or slightly projecting from the hymenium; Gloeocystidia and Cystidia lacking; Basidia cylindrical-clavate; Basidiospores ovoid, ellipsoid, with prominent apiculus, medium sized, wall smooth, hyaline under the microscope, white or pink in mass, non-amyloid.

Type : *Corticium roseum* PERS.

Family : Corticiaceae.

Japanese name : Kiiro-komebatake-zoku (AOSHIMA & FURUKAWA).

Species in Japan : *L. sulphurellum* (PECK) GILBERTSON.

Note.

This genus was established by DONK in 1956 designating *Corticium roseum* PERS. as type species, characterized in having antler-like hyphidia in the hymenium.

As early as in 1941, DONK reported that *Corticium roseum* has extremely peculiar microscopical characters and, hence, there is a need to consider it apart from other *Corticium* group.

In his report, DONK described five species including *L. roseum* (PERS. ex FR.) DONK (=*Thelephora rosea* (PERS. ex FR.) FR.); *L. polygonioides* (P. KARST.) DONK (=*Corticium polygonioides* P. KARST.); *L. jonides* (BRES.) DONK (=*Corticium jonides* BRES.); *L. minnsiae* (H. S. JACKS.) DONK (=*Aleurodescus minnsiae* H. S. JACKS.); *L. pini* (H. S. JACKS.) DONK (=*Aleurodescus pini* H. S. JACKS.), but one species, *L. sulphurellum* (PECK) GILBERTSON was found in Japan.

1) ***Laeticorticium sulphurellum* (PECK) GILBERTSON** (Fig. 52, 53, Pl. 11, E, F, 12, H)

Mycologia, 54 : 673, 1962; AOSHIMA & FURUKAWA, Trans. mycol. Soc. Japan, 7(2～3) : 147, 1966.

Synonym : *Hydnum sulphurellum* PECK, N. Y. State Mus. Rep. 31 : 38, 1879.

Grandinia sulphurellum (PECK) BURT, in HOUSE, N. Y. State Mus. Bull., 266 : 44, 1925.

Macroscopic characters.

Basidiocarps annual, resupinate, effused, thin, less than 1 mm thick, cartilaginous to coriaceous, crustaceous, not easily separated from substratum, cracked in dry specimen, bright sulfur yellow when fresh, Marguerite yellow to almost white when dry; Margin finely fimbriate to tomentose, abrupt, not thinning out; Hymenial surface almost smooth or with hemispherical, wart-like, 1～2 mm long; Subiculum very thin, soft, 0.2～0.5 mm thich.

Microscopic characters.

Subiculum hyphae compactly arranged of two types, the one thin to thick-walled, sometimes branched, with clamp connections, 3～4μ wide, the other thin-walled, aseptate, frequently branched, 1～1.5μ wide; antler-like hyphidia abundant in hymenial layer, these 1～2μ wide and imbedded or slightly projecting from the hymenium; Cystidia absent; Basidiospores allantoid, smooth, hyaline, 2.5～3.5×7～9μ, non-amyloid.

Cultural characters.

Growth characters : Growth medium, forming a mat 5.2 cm in diameter in 10 days on malt agar medium, 4.0 cm in diameter in 10 days on potato glucose agar medium, white, usually thick, floccose or felty, often pruinose on malt agar medium; Margin thick, floccose;

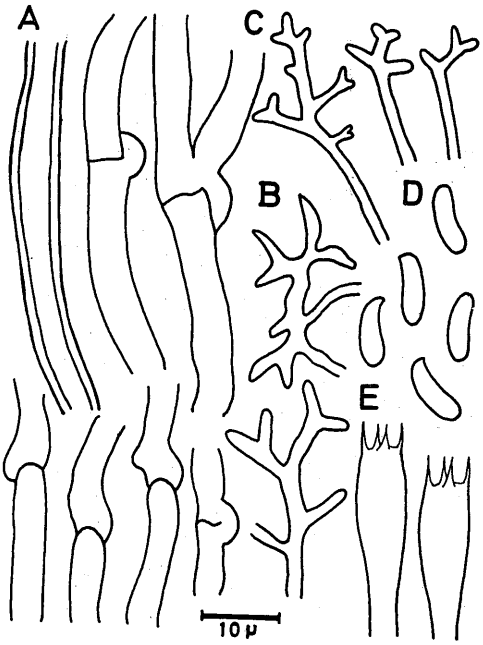

Fig. 52 Microscopic elements of *Laeticorticium sulphurellum* (Peck) Gilbertson (F-10541)
A : Subiculum hyphae B : Much-branched, slender subiculum hyphae
C : Antler-like hyphidium
D : Basidiospores E : Basidia

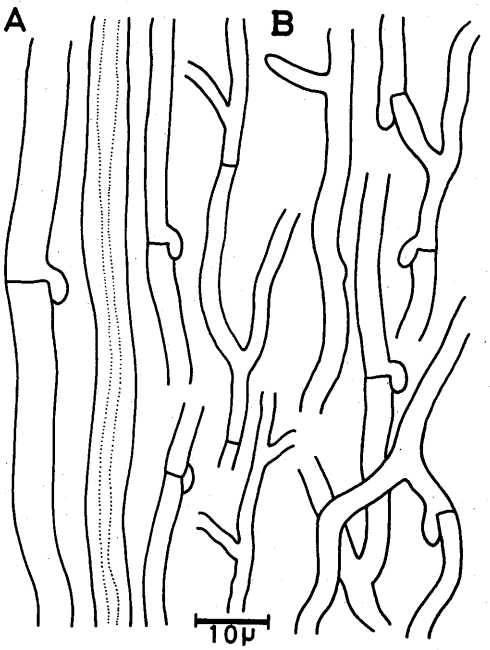

Fig. 53 Mycelial structure from a culture of *Laeticorticium sulphurellum* (Peck) Gilbertson (Od 29b)
A : Aerial hyphae B : Submerged hyphae

Odorless.

Hyphal characters : Aerial hyphae composed of two types of hyphae, the one thin-walled, surface smooth, with clamp connections, 4～6μ wide, the other very narrow, thin-walled, without clamp connections, frequently branched, slender, 2～2.5μ wide; Submerged hyphae thin-walled, surface smooth, with clamp connections, branched, 2～3μ wide; No conidia and chlamydospores were observed.

Temperature relations : Optimum 25°C. Average mycelial mat diameters in 10 days in dark at constant temperatures follow : 4.0 cm, 20°C; 5.2 cm, 25°C; 0.2 cm, 30°C; 0 cm, 35°C on malt agar medium, 2.2 cm, 20°C; 4.0 cm, 25°C; 0.6 cm, 30°C; trace, 35°C on potato glucose agar medium.

Habitat : Growing on dead branches and stems of broad-leaved trees, associated with a white rot.

Japanese name : Kiiro-komebatake (Aoshima & Furukawa).

Distribution : North America and Asia (Japan).

Specimens examined.

Shikotsu, Hokkaido, on broad-leaved tree, 10-VIII-1963, K. A., Y. H. & T. K., (F-10541, F-10540); 2-IX-1948, R. Imazeki, (F-10617), 10-VIII-1963, K. A., Y. H. & T. K., (F-11346); Otoineppu, Hokkaido, on broad-leaved tree, 7-IX-1969, K. A., Y. H. & H. F., (F-11348); Numanohara, Soounkyo, Hokkaido, on broad-leaved tree, 11-IX-1969, Y. H. & H. F., (F-11347 ♂ Od 29b);

Towada, Aomori pref., on broad-leaved tree, 9-IX-1964, Y. H., (F-11349).

Note.

This species is distributed in Hokkaido and Aomori prefecture in Japan, and resembles species of *Odontia* in its external shape.

Fresh specimens in the field have bright sulfur yellow color but this fades to almost white after drying. Microscopically, the large allantoid spores and branched hyphidia are distinctive.

Gilbertson (1962) studied the original specimen (on *Acer spicatum*, Griffins, New York, C. H. Peck, Sept., 1878. Associated with a white rot.) and he adopted the genus *Laeticorticium* for this species.

6. ***Mucronella*** Fries

Hym. Eur., 629, 1874; Karsten, Myc. Fenn., Basidiomycetes, 14, 1876; Lloyd, Myc. Writ., & Myc. Notes, 39 : 531, 1915; Miller, Mycologia, 26 : 214, 1934; Corner, Monogr. *Clavaria*, 415, 1950; Nikolajeva, Fl. Pl. Crypt. URSS 6(2) : 208, 1961.

Synonym : *Mucronia* Fr., Summ. Veg. Scand., 329, 1849.

Basidiocarps subulate, cylindrical to conical, shape pointed, densely gregarious; Subiculum absent, hymenial layer very thin; Basidia small, 4-spored; Spores hyaline, smooth, thin-walled, ellipsoid to globose; Cystidia absent; Hyphae system monomitic, with clamps.

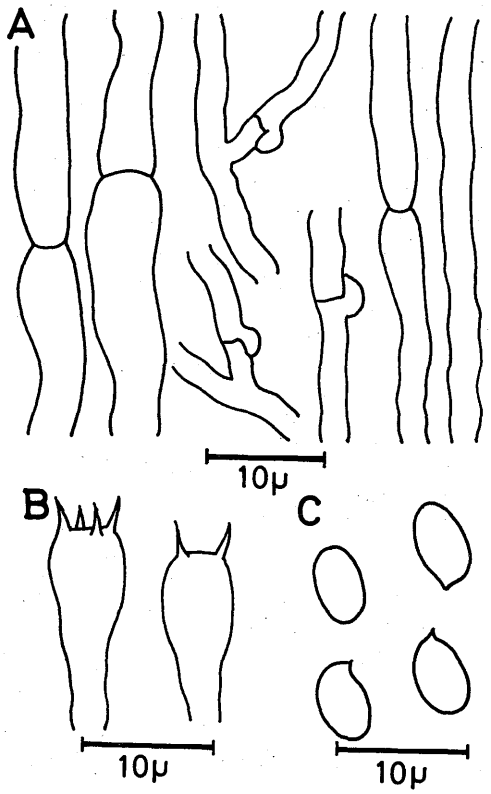

Fig. 54 Microscopic elements of *Mucronella aggregata* Fr. (F-10570)
A : Tramal hyphae B : Basidia
C : Basidiospores

Type species : *Hydnum calvum* Fries.

Family : Clavariaceae.

Japanese name : Kome-haritake-zoku (Furukawa).

Species in Japan : *M. aggregata* Fr.

Note.

Mucronella Fr. was included in Hydnaceae by Fries (1874), Miller (1934a), Nikolajeva (1961) and Y. Kobayasi (1939) etc., but Corner (1950) placed it in Clavariaceae. The writer thinks that as the spinal fruit body is formed constantly facing the lower direction, this feature represents the most fundamental and primitive aspect of Hydnaceae. Judging from hyphal system which comprises the fruit body of this genus, it should be placed in the family Clavariaceae.

1) ***Mucronella aggregata*** Fries (Fig. 54, Pl. 11, G, H)

Monogr. Hym. Sue., 2 : 280, 1863, Hym. Eur., 629, 1874; Lloyd, Myc. Notes., 39 : 531, 1915; Miller, Mycologia, 26 : 215, 1934; Corner, Monogr. *Clavaria*, 451～452, 1950; Nikolajeva, Fl. Pl. Crypt. URSS 6(2) : 210, 1961.

Synonym : *Hydnum nudum* Berkeley et Curtis, Grevillea, 1 : 100, 1873, in Gilbertson, Mycologia, 57 : 859, 1965.

Macroscopic characters.

Basidiocarps conical, sharp pointed, 0.5～1.5 mm long, densely gregarious, white when fresh, light yellowish brown when dry; Subiculum absent.

Microscopic characters.

Tramal hyphae thin-walled, with clamp connections, sometimes branched, 2～4μ wide; Cystidia absent; Basidia clavate, 3～5×10～15μ, 4-spored; Basidiospores ellipsoid, smooth, hyaline, 2.5～3.5×4～6.5μ,

Habitat : On dead wood.

Japanese name : Kome-haritake (Furukawa).

Distribution : Europe, North America and Asia (Japan).

Specimens examined.

Portage du Fort. Que., Canada, July 12, 1961, K. A., (Det. by L. K. Weresub) (DAOM 72482).

Uchinoura, Kagoshima pref., VII-1962, K. A., (F-10570).

Note.

Absence of subiculum, white small and conical spiny fruit bodies are the macroscopic characters for this species.

VI Phylogenetic consideration on the niche of the genus *Odontia* and its allied genera in the taxonomical system of Aphyllophorales

Most of the species of Aphyllophorales are wood rotting fungi, and all the species of six genera which the writer treats in this paper are the wood rotting fungi.

Two decay types have been recognized in the wood rotting fungi from the original report by R. Hartig (1878); one is white rot type and the other brown rot type. The former attacks mostly lignin in the wood, and the latter cellulose.

In the Hydnaceae of Friesian system, all the species of *Gyrodontium* Pat. (Syn. *Boninohydnum* S. Ito et Imai) are brown rot fungi, whereas such genera represent the white rot species as *Climacodon* P. Kars., *Mycorrhaphium* Mass G., *Steccherinum* S. F. Gray, *Hericium* Pers. ex S. F. Gray, *Mycoleptodonoides* Nikol., *Odontia* Fr., *Mycoacia* Donk, *Dentipellis* Donk, *Basidioradulum* Nobles and *Echinodontium* Ell. et Ev. In Polyporaceae of Friesian system, the genus *Daedalea* Pers. ex Fr. is characterized by the brown rot fungi, and the genera *Fomes* Fr. and *Ganoderma* Karst. etc. the white rot fungi. In Stereaceae, the genus *Columnocystis* Pouz. represent the brown rot species, and the genus *Stereum* Pers. ex Fr. and other genera the white rot species. (Aoshima and Furukawa have an idea to establish the new family Veluticepsaceae including the genera *Veluticeps* Cooke and *Columnocystis* Pouz.)

1. Morphologic characters

a) Hyphal system.

Hyphae constituting fruit body of Aphyllophorales have three differentiated types : 1) generative hyphae, 2) skeletal hyphae and 3) binding hyphae. Fruit body organized by only generative hyphae is monomitic, by generative and skeletal hyphae is dimitic, and by generative, skeletal and binding hyphae is trimitic. The character of monomitic hyphal system is

considered to be most primitive and that of trimitic is advanced.

The genera characterized by the monomitic hyphal system are *Gyrodontium*, *Climacodon*, *Mycorrhaphium*, *Hericium*, *Mycoleptodonoides*, *Odontia*, *Mycoacia*, *Basidioradulum*, *Mucronella* etc., and the genera *Steccherinum*, *Dentipellis*, *Laeticorticium*, *Columnocystis* and *Veluticeps* have dimitic hyphal system. Similarly, the genera with trimitic hyphal system are *Fomes*, *Ganoderma* and *Coriolus*, and these three genera are white rot fungi. Therefore, brown rot fungi have monomitic or dimitic hyphal system, and white rot fungi have three differentiated types, monomitic, dimitic and trimitic hyphal systems.

b) Basidiospores.

Basidiospores are globose, obovate, elliptical or allantoid and have verious size. They are smooth, verrucose or echinulate on the surface. A certain species of the genus *Dentipellis* (*D. echinospora* Furukawa) and *Echinodontium* have echinulate spores, and the genus *Ganoderma* has double-walled spores. All other genera mentioned before have smooth spores.

Verrucose or echinulate spores are considered to be more advanced, and only white rot fungi have such ornamented spores.

c) Cystidia and gloeocystidia.

Cystidia are clavate, lanceolate, capitulate and so on in shape and thin-walled or sometimes slightly thick-walled, usually naked or sometimes incrusted. Usually cystidia arise from specialized generative hyphae in hymenium.

Gloeocystidia are considered to be differentiated from cystidia by characters with oily, resinous, granular contents.

In Hydnaceae, the genera with cystidia are *Climacodon*, *Steccherinum*, *Odontia* and *Echinodontium*, and those with gloeocystidia are *Hericium* and *Dentipellis*. However, in *Gyrodontium*, *Mycorrhaphium*, *Mycoleptodonoides*, *Mycoacia* and *Basidioradulum* cystidia or gloeocystidia are lacking.

Most cystidia of the genus *Odontia* are simple shaped. In Group I of the writer's classification of the genus *Odontia*, in *Climacodon* and *Steccherinum* cystidia arise from specialized generative hyphae of axial portion in the spine and incrust heavily. In Group II and III cystidia arise from specialized generative hyphae of terminal part in hymenium and are simple shaped. In *Echinodontium* cystidia arise from specialized skeletal hyphae. They are thick-walled and incrusted heavily. For this reason, it should be supposed that a genus with cystidia is more advanced than one without cystidia. And more advanced is the cystidia with complex shape, and arising from skeletal hyphae. The genus with gloeocystidia is considered to be more advanced than one without gloeocystidia.

Dentipellis echinospora has complex characters; gloeocystidia, echinulate and amyloid spores, therefore this species is considered to be more advanced in the genus *Dentipellis*.

2. **Sexuality**

The types of mating system of Aphyllophorales are either bipolar or tetrapolar. Tetrapolar type is more complex in nuclear division and more advanced than the bipolar type. However, Raper & Flexer (1971) reported that bipolar type was more advanced than tetrapolar type.

In Aphyllophorales, *Fomes fomentarius*, *Daedaleopsis confragosa*, *Tyromyces albellus*, *Lenzites betulina*, *Coriolus hirsutus*, *Basidioradulum radula* and most advanced species *Ganoderma applanatum* are all tetrapolar type, and *Daedalea heteromorpha*, *D. variiformis*, *D. quercina* and *Fomitopsis*

pinicola are bipolar type. The species with tetrapolar type are white rot fungi and with bipolar type are brown rot fungi. Therefore, it should be concluded that white rot fungi are more advanced than brown rot fungi.

3. **Enzyme**

a) Phenol oxidase.

There are two types of phenol oxidase in wood rotting fungi, one is laccase type and the other tyrosinase type. White rot fungi belonging in such genera as *Climacodon, Steccherinum, Hericium, Mycorrhaphium, Mycoleptodonoides, Odontia, Mycoacia, Dentipellis, Basidioradulum, Laeticorticium, Mucronella, Echinodontium, Fomes, Ganoderma* and *Stereum* have both phenol oxidases, and brown rot fungi of *Gyrodontium, Daedalea, Columnocystis* and *Veluticeps* have only a tyrosinase type phenol oxidase. This phenomenon affords a basis for BAVENDAMM's reaction.

Therefore, white rot fungi which have two types of phenol oxidase are more advanced than brown rot fungi which have only tyrosinase type.

b) Oxalic acid decompose enzyme.

White rot fungi accumulate oxalic acid by process of metabolism, whereas lignin decomposing fungi do not. This phenomenon is caused by the presence or absence of certain enzyme. Only lignin decomposing fungi have the enzyme that decompose oxalic acid. For this reason, it may be suggested that lignin decomposing fungi with oxalic acid that decompose enzyme are more advanced than cellulose dissolving fungi which lack this enzyme.

c) Amylosynthease.

In certain species of Aphyllophorales, mature basidiospores change their colour blue when treated with IK solution. This amyloidity of mature basidiospores is caused by the presence of amylose, and in addition it may be supposed the presence of amylosynthease in the basidiospores. If it is true, only white rot fungi have this enzyme. Therefore, white rot fungi are more advanced than brown rot fungi which lack this enzyme. Of the genera in Hydnaceae of Friesian system, the genera *Hericium, Dentipellis* and *Echinodontium* which have been suggested to have the presence of amylosynthease are more advanced than the genera *Climacodon, Mycorrhaphium, Mycoleptodonoides, Odontia, Mycoacia* and *Basidioradulum* which lack the enzyme.

The comparison of the important characters shows that white rot fungi are more complex than brown rot fungi in every morphological and physiological character. Therefore, white rot fungi situate in the more advanced stage in the fungus evolution.

In Hydnaceae of Friesian system, *Steccherinum, Dentipellis* and *Echinodontium* are exceptional genera for the reason that they have dimitic hyphal system.

Every genera in the Hydnaceae family which the writer treated in this paper were all white rot fungi, and being comparatively simple in morphological characters, the genera may be placed in the primitive group of white rot fungi in Hydnaceae of Friesian system. Among them, the genus *Mycoacia* is the most primitive without cystidia, then developed to *Odontia* with cystidia. The genus *Dentipellis* is more advanced than the genera *Odontia, Mycoacia* and *Basidioradulum* because its hyphal system is dimitic and of an advanced character with gloeocystidia and amyloid spores.

The genus *Laeticorticium* was placed in Corticiaceae by DONK in 1956. It is phylogenically the same as the genus *Corticium.* However, in respect of hymenium with abundant antler-like hyphidia, the genus *Laeticorticium* is a little more advanced than the genus *Corticium.*

The genus *Mucronella* was transferred from Hydnaceae to Clavariaceae by CORNER in 1950 based on the difference of hyphal system. The writer thinks the genus *Mucronella* which has spinal fruit body facing constantly the lower direction represents the most fundamental and primitive aspect of Hydnaceae. Therefore, this genus has the characters of both Hydnaceae and Clavariaceae.

Ⅶ Summary

Taxonomic studies of the genus *Odontia* and other related genera are treated, based on the Japanese collections. The results are summarized in the following :

1. The total number of species treated in this report is 44 belonging to 6 genera as follows :

Odontia, 31 species; *Mycoacia*, 4 species; *Dentipellis*, 2 species; *Basidioradulum*, 5 species ; *Laeticorticium* (Corticiaceae), 1 species; *Mucronella* (Clavariaceae), 1 species.

2. The most importatn character of the family Hydnaceae is its hymenophores made of spines and teeth, in addition to this the apex of spine and tooth is always sterile. These spines and teeth in their real sense (Fig. 1), have been confirmed in such genera as *Odontia*, *Mycoacia*, *Dentipellis* and *Basidioradulum*. These genera should be treated under Hydnaceae.

The genera *Laeticorticium* and *Mucronella* have not the spines and teeth in their real sense, but in external morphologic characters they resemble the genera *Odontia* and *Mycoacia*.

The genera *Laeticorticium* and *Mucronella* belong to Corticiaceae and Clavariaceae, respectively.

3. Thirty-one Japanese species of the genus *Odontia* were classified into three groups by the type of the specialization and the development of cystidia. They are as follows :

Group 1 : Cystidia arising from specialized axial hyphae of the spine. This group includes 4 species.

Group 2 : Cystidia arising from specialized terminal hyphae of trama in the spine. This group includes 26 species.

Group 3 : Cystidia slender hyphoid, projecting only at the apex of the spine. This group includes 1 species.

Twelve new species and ten species which have not hitherto been recorded for the Japanese fungus flora were described as follows :

New species

1) *Odontia byssoideum* FURUKAWA sp. nov.
2) *O. subspathulata* FURUKAWA sp. nov.
3) *O. irregularis* FURUKAWA sp. nov.
4) *O. verruca* FURUKAWA sp. nov.
5) *O. rufobrunneus* FURUKAWA sp. nov.
6) *O. subalutacea* FURUKAWA sp. nov.
7) *O. ochraceum* FURUKAWA sp. nov.
8) *O. longospora* FURUKAWA sp. nov.
9) *O. lanceolatum* FURUKAWA sp. nov.
10) *O. macroverruca* FURUKAWA sp. nov.
11) *O. pelliculae* FURUKAWA sp. nov.
12) *O. mucronata* FURUKAWA sp. nov.

New to Japan

1) *Odontia fimbriata* Fr.
2) *O. ciliolata* (Berk. et Curt.) Miller
3) *O. barba-jovis* Fr.
4) *O. aspera* (Fr.) Bourd. et Galz.
5) *O. rimosissima* Peck
6) *O. papillosa* Bres.
7) *O. transiens* Bres.
8) *O. sudans* (Alb. et Schw. ex Fr.) Bres.
9) *O. subabrupta* Bourd. et Galz.
10) *O. queletii* Bourd. et Galz.

4. In addition to three species which have been recorded in the genus *Mycoacia* in Japan, one new combination, *Mycoacia chrysella* (Berk. et Curt.) Furukawa comb. nov. (=*Hydnum chryselllum* Berk. et Curt.) was described and recorded in Japan for the first time.

5. The genus *Dentipellis* is a genus established by Donk in 1962 based on *Hydnum fragile* Pers. ex Fr. as the type species. The smooth and amyloid spores are the main characters of the genus as described in the original description. However, the writer found a species which has echinulate basidiospores, although other characters are completely the same with those of all the species included in the genus *Dentipellis*. The writer revised the concept of the genus, adding echinulate characters of spores. The following two species are treated as new combinations and confirmed to be new additions to the flora of Japan.

1) *Dentipellis macrodon* (Pers. ex Fr.) Furukawa comb. nov. (=*Hydnum macrodon* Pers. ex Fr.)
2) *D. echinospora* Furukawa sp. nov.

6. In the genus *Basidioradulum*, the following four species are treated as new combinations, and three species are confirmed to be new additions to the flora of Japan.

New combination.

1) *Basidioradulum pallidum* (Berk. et Curt.) Furukawa comb. nov. (=*Radulum pallidum* Berk. et Curt.)
2) *B. molare* (Fr.) Furukawa comb. nov. (=*Radulum molare* Fr.)
3) *B. quercinum* (Fr.) Furukawa comb. nov. (=*Hydnum quercinum* Fr.)
4) *B. casearium* (Morgan) Furukawa comb. nov. (=*Hydnum casearium* Morgan)

New to Japan

1) *Basidioradulum pallidum* (Berk. et Curt.) Furukawa
2) *B. quercinum* (Fr.) Furukawa
3) *B. casearium* (Morgan) Furukawa

7. The genus *Laeticorticium* has not spines in their real sense, and belongs to Corticiaceae. This genus is distributed in Hokkaido and Aomori prefecture in Japan, but only species, *L. sulphurellum* (Peck) Gilbertson was found in Japan.

8. The genus *Mucronella* was included in Hydnaceae by Fries (1874), Miller (1934a), Y. Kobayasi (1939) and Nikolajeva (1961), but Corner (1950) placed it in Clavariaceae. Judging from hyphal system which comprises the fruit body, it should be placed in the family Clavariaceae. One species, *M. aggregata* Fr. was found for the first time in Japan.

Index of genera and species

1. Index of genera

2. Index of species

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Explanation of plates

Plate 1

A～B : Dried sporophores of *Odontia fimbriata* (Pers.) Fr. (F-11258)
A : ×1.5 B : ×10

C～D : Dried sporophores of *Odontia ciliolata* (Berk. et Curt.) Miller (F-11261)
C : ×1.5 D : ×10

E～F : Dried sporophores of *Odontia setigera* (Fr.) Miller (F-10696)
E : ×3 F : ×10

G～H : Dried sporophor of *Odontia barba-jovis* (Schw. ex Fr.) Fr. (F-11264)
G : ×1.5 H : ×10

Plate 2

A～B : Dried sporophore of *Odontia arguta* (Fr.) Quél. (F-10604)
A : ×1.5 B : ×10

C～D : Dried sporophores of *Odontia byssoideum* Furukawa (F-11321)
C : ×1.5 D : ×10

E～F : Dried sporophore of *Odontia aspera* (Fr.) Bourd. et Galz. (F-11239)
E : ×1.5 F : ×10

G～H : Dried sporophore of *Odontia bicolor* (Alb. et Schw. ex Fr.) Bres. (F-10046)
G : ×2 H : ×10

Plate 3

A～B : Dried sporophore of *Odontia subspathulata* Furukawa (F-10732)
A : ×1.5 B : ×10

C～D : Dried sporophore of *Odontia rimosissima* Peck (F-11197)
C : ×1.5 D : ×10

E～F : Dried sporophore of *Odontia alutacea* (Fr.) Bourd. et Galz. (F-10605)
E : ×1.5 F : ×10

G～H : Dried sporophore of *Odontia stipata* (Fr.) Quél. (F-10616)
G : ×2 H : ×10

Plate 4

A～B : Dried sporophore of *Odontia irregularis* Furukawa (F-11326)
A : ×1.5 B : ×10

C～D : Dried sporophores of *Odontia verruca* Furukawa (F-11268)
C : ×1.5 D : ×10

E～F : Dried sporophore of *Odontia rufobrunneus* Furukawa (F-11392)
E : ×1.5 F : ×10

G～H : Dried sporophore of *Odontia subalutacea* Furukawa (F-11360)
G : ×1.5 H : ×10

Plate 5

A～B : Dried sporophores of *Odontia papillosa* (Fr.) Bres. (F-11195)
A : ×1.5　B : ×10

C～D : Dried sporophores of *Odontia transiens* Bres. (F-11266)
C : ×1.5　D : ×10

E～F : Dried sporophores of *Odontia ochraceum* Furukawa (F-11355)
E : ×1.5　F : ×10

G～H : Dried sporophore of *Odontia longospora* Furukawa (F-10765)
G : ×1.5　H : ×10

Plate 6

A～B : Dried sporophore of *Odontia sudans* (Alb. et Schw. ex Fr.) Bres. (F-11196)
A : ×1.5　B : ×10

C～D : Dried sporophore of *Odontia livida* Bres. (F-10615)
C : ×1.5　D : ×10

E～F : Dried sporophore of *Odontia crustula* Miller (F-10614)
E : ×1.5　F : ×10

G～H : Dried sporophore of *Odontia lanceolatum* Furukawa (F-10050)
G : ×1.5　H : ×10

Plate 7

A～B : Dried sporophore of *Odontia subabrupta* Bourd. et Galz. (F-11267)
A : ×1.5　B : ×10

C～D : Dried sporophores of *Odontia queletii* Bourd. et Galz. (F-11259)
C : ×1.5　D : ×10

E～F : Dried sporophores of *Odontia crustosa* (Fr.) Quél. (F-10607)
E : ×1.5　F : ×10

G～H : Dried sporophores of *Odontia macroverruca* Furukawa (F-11219)
G : ×1.5　H : ×10

Plate 8

A～B : Dried sporophores of *Odontia pelliculae* Furukawa (F-11324)
A : ×1.5　B : ×10

C～D : Dried sporophores of *Odontia mucronata* Furukawa (F-10982)
C : ×1.5　D : ×10

E～F : Dried sporophores of *Odontia spathulata* (Schrad. ex Fr.) Litsch. (F-10768)
E : ×1.5　F : ×10

G～H : Dried sporophores of *Mycoacia chrysorhiza* (Torrey) Aoshima et Furukawa (F-10213)
G : ×1.5　H : ×10

Plate 9

A～B : Dried sporophores of *Mycoacia chrysella* (Berk. et Curt.) Furukawa (F-11198)
A : ×8　B : ×10

C～D : Dried sporophores of *Mycoacia himantia* (Schw.) Miller (F-10217)
C : ×1.5　D : ×10

E～F : Dried sporophores of *Mycoacia copelandii* (Pat.) Aoshima et Furukawa (F-10038)
E : ×1.5 F : ×10
G～H : Dried sporophore of *Dentipellis macrodon* (Pers. ex Fr.) Furukawa (F-11278)
G : ×1.5 H : ×10

Plate 10

A～B : Dried sporophores of *Dentipellis echinospora* Furukawa (F-10947)
A : ×1.5 B : ×10
C～D : Dried sporophore of *Basidioradulum pallidum* (Berk. et Curt.) Furukawa (F-10038)
C : ×1.5 D : ×10
E～F : Dried sporophore of *Basidioradulum radula* (Fr. ex Fr.) Nobles (F-10908)
E : ×1.5 F : ×10
G～H : Dried sporophore of *Basidioradulum molare* (Fr.) Furukawa (F-10821)
G : ×1.5 H : ×10

Plate 11

A～B : Dried sporophore of *Basidioradulum quercinum* (Fr.) Furukawa (F-11211)
A : ×1.5 B : ×10
C～D : Dried sporophore of *Basidioradulum casearium* (Morgan) Furukawa (F-10904)
C : ×1.5 D : ×10
E～F : Dried sporophores of *Laeticorticium sulphurellum* (Peck) Gilbertson (F-10541)
E : ×1.5 F : ×10
G～H : Dried sporophores of *Mucronella aggregata* Fr. (F-10570)
G : ×1.5 H : ×10

Plate 12

A～H : Two-week-old cultures on malt agar medium, at 25°C.
A : *Odontia alutacea* (Fr.) Bourd. et Galz. (Od 21a)
B : *Odontia crustula* Miller (Od 16a)
C : *Odontia mucronata* Furukawa (Od 24a)
D : *Mycoacia chrysorhiza* (Torrey) Aoshima et Furukawa (Od 7b)
E : *Mycoacia himantia* (Schw.) Miller (Od 2c)
F : *Mycoacia copelandii* (Pat.) Aoshima et Furukawa (Od 6a)
G : *Basidioradulum pallidum* (Berk. et Curt.) Furukawa (Od 15a)
H : *Laeticorticium sulphurellum* (Peck) Gilbertson (Od 29b)

日本産 *Odontia* 属および近縁属菌類の分類学的研究

古川久彦(1)

摘　要

Odontia 属（コメバタケ属）は Basidiomycetes（担子菌類），Hydnaceae（ハリタケ科）に所属する菌類で，子実体は背着生，膜状，綿毛状，革質，チョーク質で，表面にイボあるいは針をもち，子実層にはシスチジアを有するのが特徴である。子実体の色およびイボあるいは針は形態的に類似するものが多く，外部形態の特徴からは本属菌を同定することは不可能な場合が多い。本属菌は広く世界に分布し，針・広葉樹の樹皮面，材上あるいは落枝などに生じ，材の白色腐朽をおこす。

Odontia 属菌の木材に対する腐朽力は，かなり強く，森林においては落葉・落枝を分解し，有機物の土壌中への還元を促進し，自然界における物質代謝の役目をはたしている。一方，カナダでは林木の心材腐朽の原因として大きな被害をひきおこし，樹木病理学上重要な菌であることが報告されている（Davidson, 1957)。さらに，アメリカでは木筋構造物に対し，非常に大きな被害をあたえることが報告され（Silverborg, 1953)，また日本においても，東京目黒・林業試験場構内の地下倉庫の柱や天井に本属菌が発生し，大きな被害をあたえたことが報告されているので（青島・古川，1966b)，洋風家屋などの木筋構造物の重要な腐朽菌として注目すべき菌である。

近年のシイタケ栽培の増加にともない，本属菌はシイタケほだ木の害菌として，年々発生頻度も増加する傾向がみられるので，その面からも注目すべき菌である。

本属菌については，古くから Fries (1836～1838, 1873), Bourdot & Galzin (1927), Miller (1934b) らによって研究され，また Christiansen (1952) はデンマーク産，Eriksson (1958) はスェーデン産，Cunningham (1959) はニュージーランド産，Nikolajeva (1961) はロシヤ産の種類について，それぞれ報告している。最近 Gilbertson (1962～1965) は北米産の種類について，その基準標本を詳細に検討し，多くの異名関係をあきらかにした。

日本においては安田（1920)，今関・土岐（1954)，伊藤(誠)（1955）らにより，わずかに3種類が報告されていたにすぎなかったが，最近，青島・古川（1966b)，古川・青島（1966）によって7種類が追加された。筆者はその後，日本全域にわたって採集された約300の標本を詳細に検討した結果，新種12種，日本未記録10種をみいだした。

Odontia 属は背着生のハリタケ科に属する菌であるが，同じ仲間の *Mycoacia* 属，*Dentipellis* 属，*Basidioradulum* 属および形態がきわめて類似している *Laeticorticium* 属 (Corticiaceae)，*Mucronella* 属 (Clavariaceae) についても検討を試みた。

すなわち，*Laeticorticium* 属の子実体は背着生で膜状，表面に微細なイボ状突起をもっている。したがって，外部形態は *Odontia* 属にきわめて類似し，肉眼的に区別することは容易でない。しかし顕微鏡的には，子実層にのう状体がなく，薄膜で，非常に多くの枝分れをもつ細い菌糸（鹿角状菌糸）をもつことで *Odontia* 属とは区別される。さらに *Laeticorticium* 属のもつイボは，組織学的に完成されたものではなく，単に子実層が凸状になっているにすぎない。したがって，Hydnaceae には所属せず，子実体を構

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成する菌糸の性質から Corticiaceae におかれた。*Mucronella* 属もまた *Odontia* 属に類似するが，子実体は肉質で，シスチジアをもたない。子実体の形態から本属を Hydnaceae としてあつかった研究者もいるが (Fries 1874, Miller 1934b, Y. Kobayasi 1939, Nikolajeva 1961)，筆者は本属菌の子実体を構成する菌糸の性質から，Corner (1950) の意見にしたがい，Clavariaceae としてあつかった。いずれにしても *Laeticorticium* 属および *Mucronella* 属は，その外部形態が *Odontia* 属ときわめて類似し，肉眼的に区別することはきわめて困難な属である。

本報告では *Odontia* 属を中心とし，その近縁属および類似属を含めて，生態的特性と培養的性質を可能な限り検討し，種類の記載および近縁属間の類縁関係を明確にした。

Odontia 属は *Mycoacia, Caldesiella, Asterodon, Grandinia, Oxydontia, Radulum, Gloiodon, Steccherinum, Auriscalpium, Hericium, Hydnodon, Calodon, Grammothele* の各属とともに Hydnaceae におかれていた。元来 Hydnaceae の菌類は子実層面に針状の突起が密生し，その表面に子実層が発達する菌のグループであり，科の基準に *Hydnum* 属がおかれ，*Hydnum* 属の基準種に *Hydnum repandum* Fr. が指定されている。現在 Hydnaceae におかれている多くの属，種類は，この科の基準種である *H. repandum* に比較して，異質，異系統のものが含まれており，Hydnaceae がいかに系統的に矛盾を含んだ科であるかがわかる。しかし，近代分類学（自然分類）が進歩するにつれて，断片的ではあるが，この矛盾は改められつつある。たとえば，Bankeraceae Donk (1961)，Auriscalpiaceae Mass G. (1963) および Echinodontiaceae Donk (1961) などの新しい科の分離，独立がそれである。これらの新しい科の提案の根拠は，子実層托の形態が針状であるという外部形態のみでは真の系統，類縁関係を把握することができない点にある。確かに近代分類学では外部形態よりも，顕微鏡的性質，とくに子実体を構成する菌糸の組成，性質および諸試薬に対する化学反応などが重要視され，それらの形態性質を総合して，進化，系統論的基盤の上に成立する自然分類がおこなわれてきた。

Eriksson (1958) は *Peniophora pallidula* (Bres.) Bres. ex Bound. et Galz. を基準種として *Hyphodontia* 属を新設し，*Odontia* 属から 11 種，*Radulum* 属から 1 種，*Corticium* 属から 2 種，*Peniophora* 属から 6 種類をこの属に含め，Corticiaceae（コウヤクタケ科）に所属させた。その結果，Donk (1964) が総説するように現在では *Odontia* 属や *Mycoacia* 属は，*Corticium* 属や *Peniophora* 属の一部と系統的には同一であるとして，それらを Hydnaceae から除外し，Corticiaceae に所属させている。

子実層面の形態は，Corticiaceae の基準属である *Corticium* では平滑であり，Hydnaceae の基準属である *Hydnum* では針が形成される。筆者は，この生態的，形態的特性を見逃すわけにはいかない。

この場合 *Hydnum* における針とは，組織学的に完成された針であって，針の軸には必ず子実層托 (trama) が存在し，針の頂部は常に胞子を作る能力をもつ器官（担子基，basidia）をもたないことである。これが真の針である。このことは筆者が検討した *Odontia, Mycoacia, Steccherinum, Mycorrhaphium, Mycoleptodonoides, Dentipellis,* および *Basidioradulum* の各属の種類がもつ針，歯，イボについても全く同様であることを確認している。

Hyphodontia pallidula (Bres.) Eriksson (*Peniophora pallidula* Bres. ex Bourd. et Galz.) の子実層の表面には細かいイボ状突起がある。Eriksson (1958) および Christiansen (1960) は，このイボ状突起を hydnoid あるいは wart-like と記載しているが，これは組織学的に完成されたイボではなく，単に子実下層の凹凸にすぎない。odontoid, hydnoid, tooth-like, wart-like という言葉は真の針，イボを現わすものではなく，単に実質あるいは子実下層の凹凸や，子実層面上に不規則に群生する菌糸のかたまりなどを指す言葉である。

このように真の針，歯，イボをもつ仲間は Hydnaceae に所属すべきものであって，*Corticium* 属のように子実層面が平滑のものや，*Peniophora* 属の一部の種類のように odontoid や hydnoid の仲間とは根本的に異なっている。

本報告に記載する *Odontia, Mycoacia, Dentipellis, Basidioradulum* の各属は，上記の考え方を基盤として検討したものであって，この 4 属は Hydnaceae に所属すべきものと結論した。

以下検討した各属について概要をのべる。

I　***Odontia*** FRIES（コメバタケ属）

本属菌の子実体は背着生であって，子実層托には小さな針，イボ状の突起があり，子実層にはのう状体を有する。

本属菌の分類・同定上，もっとも重要な特徴はのう状体である。のう状体が子実体のどの組織の菌糸から分化し，発達するかは，重要な分類基準となる。この観点から日本産31種類についてみるとつぎの3つの群に分けられる。

第 1 群

のう状体は実質組織の深部より出発し，針の先端に向かって伸び，先端部から長く突出する。細胞膜は厚い。多くの場合，このグループに属する種類の実質菌糸は他のグループに属する種類と比較して，膜がやや厚い。日本産4種がこのグループに属する。

第 2 群

のう状体は子実層托の菌糸の先端の細胞が分化してできる。したがって，のう状体の出発点は浅い。のう状体の形態は変化にとみ，また形態の異なる2つののう状体をもつ種類もある。のう状体の位置は第1群は針の先端部のみに限って突き出ているのに対し，この群の種類では針の先端部および子実層面からも突き出る。しかし，突出する長さは短い。多くの場合子実体の実質の菌糸は薄膜である。日本産26種が属する。

第 3 群

針の先端部の菌糸からののう状体の分化が不完全であって，のう状体様状となって短く突出する。日本産1種がこれに該当する。

本属の最も普通の型は第2群であって，第1群および第3群に属する種類はやや特異型といえる。第1群に属する種類のうちには，DONK (1957) によって *Hyphoderma* 属に，ERIKSSON (1958) によって *Hyphodontia* 属に含められているものもあるが，筆者は前述したように，これらの種類がもつ針の性質からみて，あきらかに Hydnaceae におくべき種類であること，およびこの群に含まれる *O. fimbriata* は *Odontia* 属の基準種であることの2つの理由からこれらの種類を *Odontia* 属菌として扱った。

第3群は *O. spathulata* 1種が属するが，シスチジアは完全な分化の形態をとっていない。したがって，MILLER (1934b) は一応 *Odontia* 属として取り扱っているものの，*Radulum*？として併記している。*O. spathulata* ののう状体をどう解釈するかによって，*Odontia* 属あるいは *Radulum* 属 (*Basidioradulum* 属) におくかが決定されることになるが，筆者は分化の程度の弱いのう状体と解釈し，さらに子実体を構成する菌糸の性質，針の形態からみて本種を *Odontia* 属においた。

現在までに検討した種類は31種で，この中に10の日本未記録種と12の新種が含まれる。以下に日本未記録種および新種を列挙する。

日本未記録種

1) *Odontia fimbriata* FR. ヒモツキコメバタケ—新称
2) *O. ciliolata* (BERK. et CURT.) MILLER フサツキコメバタケ—新称
3) *O. barba-jovis* FR. ワタコメバタケモドキ—新称
4) *O. aspera* (FR.) BOURD. et GALZ. キコナコメバタケ—新称
5) *O. rimosissima* PECK ササクレコメバタケモドキ—新称
6) *O. papillosa* BRES. コナカブリコメバタケ—新称
7) *O. transiens* BRES. カンバノコメバタケ—新称
8) *O. sudans* (ALB. et SCHW. ex FR.) BRES. ニカワコメバタケ—新称
9) *O. subabrupta* BOURD. et GALZ. ヒメコメバタケ—新称
10) *O. queletii* BOURD. et GALZ. カタコメバタケ—新称

新　種

1) *Odontia byssoideum* Furukawa sp. nov. ニセワタコメバタケ
2) *O. subspathulata* Furukawa sp. nov. ニセヘラバタケ
3) *O. irregularis* Furukawa sp. nov. ミダレコメバタケ
4) *O. verruca* Furukawa sp. nov. イボコメバタケ
5) *O. rufobrunneus* Furukawa sp. nov. アカコメバタケ
6) *O. subalutacea* Furukawa sp. nov. チリメンコメバタケ
7) *O. ochraceum* Furukawa sp. nov. ニクイロコメバタケ
8) *O. longospora* Furukawa sp. nov. ウスカワコメバタケ
9) *O. lanceolatum* Furukawa sp. nov. トガリコメバタケ
10) *O. macroverruca* Furukawa sp. nov. オオハリコメバタケ
11) *O. pelliculae* Furukawa sp. nov. カワコメバタケ
12) *O. mucronata* Furukawa sp. nov. ミナミコメバタケ

II ***Mycoacia* Donk**（ヒイロハリタケ属）

Mycoacia Donk (1931), *Oxydontia* Miller (1933a, b) および *Sarcodontia* S. Schulzer (1866) の3属の性格はきわめて類似している。この3属の関係については Rageb (1951), Donk (1952), Nikolajeva (1961) らの活発な論議がある。

Mycoacia 属は *Hydnum fusco-atrum* Fr. ex Fr. を基準種とする属であるが，*H. fusco-atrum* はのう状体を有する種類である。Donk の原記載によると“実質は薄膜菌糸からなり，子実層にはのう状体が少ないか，またはない”という。

一方，*Oxydontia* 属の基準種は *Hydnum setosum* Pers. である。

Sarcodontia 属の基準種は *S. mali* S. Schulz. であるが，この種類は *S. setosa* (Pers.) Donk の異名とされているが，青島・古川 (1966a) は，本種の“実質の大部分は厚膜菌糸よりなりたち，子実層にはのう状体が存在する”という特徴を明確にした。

以上のことから *Oxydontia* 属は *Sarcodontia* 属の異名となることが明確になり，さらに *Mycoacia* 属についても“実質菌糸は薄膜，のう状体は少ないか，またはない”という特徴が明確になった。そして，和名：ヒイロハリタケ属（青島・古川）があたえられた。日本では現在までに下記の4種類（1つの新組合わせを含む）が記載されている。

1) *Mycoacia chrysorhiza* (Torrey) Aoshima et Furukawa　ヒイロハリタケ（青島・古川）
2) *M. chrysella* (Berk. et Curt.) Furukawa comb. nov.　キハリタケ（安田），キコハリタケ（伊藤（誠））
3) *M. himantia* (Schw.) Miller et Boyle　ウスチャサガリハリタケ（青島・古川）
4. *M. copelandii* (Pat.) Aoshima et Furukawa　サガリハリタケ（安田）

III ***Dentipellis* Donk emend Furukawa**（ハナレハリタケ属—新称）

Donk (1962) は背着生 Hydnaceae の中から，実質の菌糸は非アミロイド性，菌糸に扣子体があり，子実層にはグロエオシスチジアをもち，胞子は平滑でアミロイドの性質をもつ *Hydnum fragile* Pers. ex Fr. を基準種として，*Dentipellis* 属を新設し，*Hydnum fragile* Pers. ex Fr. および *Hydnum separans* Peck を本属においた。

筆者の記載した一新種 *D. echinospora* Furukawa は上記の属の特徴を完全にそなえるが，胞子にトゲがある。筆者は本種を本属の種類として取り扱い，Donk の属の特徴のうち胞子について“表面は粗またはトゲ状になる”を追加，改定した。

日本では下記の2種類が記載されている。なお，本属は日本初産の属であるので，本属に対し，和名をハナレハリタケ属とあたえた。

1) *Dentipellis macrodon* (Pers. ex Fr.) Furukawa comb. nov. ハナレハリタケ—新称
2. *D. echinospora* Furukawa sp. nov. ハナレハリタケモドキ—新称

IV ***Basidioradulum*** **Nobles**（オクバタケ属）

本属菌の種類は従来 *Radulum* 属として取り扱われたが，*Radulum* Fr. 属の基準種とされた *Radulum aterrimum* Fr. は子のう菌の一種 *Eutypa hydnoidea* (Fr.) Höhn (Sphaeriales, Ascomycetes) であることが Donk (1956b) によって確認された。したがって，Nobles (1967) は *Hydnum radula* (Fr.) Fr. を基準種として，*Basidioradulum* 属を創設した。

本属は子実体の辺縁部がわずかに反転する種類と，全く背着生のものとに大別される。そして背着生の種類は，針が個々に分離しているものと合着するものの2つのグループに分けることができた。

筆者は日本産の種類に対して *Basidioradulum* Nobles を採用し，新組合わせとするとともに，日本初産の4種類に対してそれぞれ和名をあたえた。

1) *Basidioradulum pallidum* (Berk. et Curt.) Furukawa comb. nov. アメイロオクバタケ—新称
2) *B. radula* (Fr. ex Fr.) Nobles　ウロコオクバタケ—新称
3) *B. molare* (Fr.) Furukawa comb. nov. オクバタケ（安田）
4) *B. quercinum* (Fr.) Furukawa comb. nov. アカオクバタケ—新称
5) *B. casearium* (Morgan) Furukawa comb. nov. キチヤオクバタケ—新称

V ***Laeticorticium*** **Donk**（キイロコメバタケ属）

本属は *Corticium roseum* Pers. を基準種として，1956年に Donk により創設された属でその特徴は子実体は背着生，薄い膜状で，菌糸は薄膜～厚膜で担子体をもち，子実層には薄膜で，非常に多くの短い枝分れをもつ細い菌糸（鹿角状菌糸）がある。Corticiaceae（コウヤクタケ科）に所属する。

日本では，下記の1種が知られており，北海道および青森県の北部にのみ産する。

L. sulphurellum (Peck) Gilbertson　キイロコメバタケ（青島・古川）

VI ***Mucronella*** **Fries**（コメハリタケ属—新称）

Mucronella 属は Fries (1874), Miller (1934a), Y. Kobayasi (1939) および Nikolajeva (1961) は Hydnaceae（ハリタケ科）に含め，Corner (1950) は Clavariaceae（ホウキタケ科）に所属させた。

筆者は針状の子実体が常に下方に向かってできる性質はハリタケ科のもっとも基本的な，しかも原始的な形態であると考えられるが，本属の子実体は肉質であり，さらに子実体を構成する菌糸の性質から考えて，ホウキタケ科におくことがもっとも妥当であると結論した。そして，和名をコメハリタケ属（新称）とした。

日本では，*M. aggregata* Fr. コメハリタケ（新称）の1種が産するのみである。

つぎに，ヒダナシタケ目における *Odontia* 属および近縁属の分類学的位置について，系統発生学的な考察をくわえた。担子菌類のヒダナシタケ目（Aphyllophorales）に属する菌類の大部分の種類は木材腐朽性である。筆者が本報告で取り扱った *Odontia* 属およびその近縁属の種類もこの例にもれない。木材腐朽菌は木材の構成分（主としてリグニンおよびセルロース）を分解し，この分解物を栄養源として生活する菌類であるから，地球上に樹木が出現して以後に，それらを分解して生活する木材腐朽菌類が出現してきたと考えられる。そして，その長い過程の中で，ときには新しい種類が出現し，またときには絶滅したりすることが繰り返されていたであろうと想像できる。このことは他の生物界の歴史と全く同様であったと思われる。

現在地球上に生息する木材腐朽菌の栄養摂取の様式には，次の2つの型がある。その1つは，木材中のリグニンを分解するもの（木材の白色腐朽を起因する種類）と，他の1つはセルロースを分解して栄養源とするもの（褐色腐朽を起因する種類）である。そして，この2つの型が明りょうに区別されることは

R. Hartig (1878) の研究以後，世界各国における多数の研究によって認められている。この事実は木材腐朽菌類の系統分類学上，重要な意味をもつものとして，最近では形態的特徴とともに重要視されている。すなわち，Friesian system の Hydnaceae では *Gyrodontium* Pat. 属 (Synonym. *Boninohydnum* S. Ito et Imai 属) は，褐色腐れを起因するセルロース溶解菌を包含する属であるのに対し，*Climacodon* P. Karst., *Mycorrhaphium* Mass G., *Steccherinum* S. F. Gray, *Hericium* Pers. ex S. F. Gray, *Mycoleptodonoides* Nikol., *Odontia* Fr., *Mycoacia* Donk, *Dentipellis* Donk, *Basidioradulum* Nobles および *Echinodontium* Ell. et Ev. の各属は，すべて白色腐朽を起因するリグニン分解菌である。また Friesian system の Polyporaceae (サルノコシカケ科) では，*Daedalea* Pers. ex Fr. は褐色腐れをおこす種類を包含する属であり，*Fomes* Fr., *Ganoderma* Karst. などは白色腐れをおこす。さらに，Stereaceae においては *Columnocystis* Pouz. および *Veluticeps* Cooke はいずれも褐色腐朽菌であるが，*Stereum* Pers. ex Fr. をはじめとするその他の属はすべて白色腐朽菌である（青島・古川（未発表）は *Veluticeps* を基礎として Veluticepsaceae を新設)。

I 形　態

a) 菌　糸

ヒダナシタケ目の子実体を構成する菌糸は，1) 薄膜で分岐が多く，担子体を有する生成菌糸 (generative hyphae)，2) 厚膜で分岐と隔膜が少なく，担子体を持たない骨格菌糸 (skeletal hyphae)，3) 厚膜または薄膜で分岐が非常に多く，膠着状をなした結合菌糸 (binding hyphae) の3つの分化型から構成される。そして，これらの組合わせによって，生成菌糸だけで子実体が構成される場合を1菌糸型 (monomitic)，生成菌糸＋骨格菌糸の場合を2菌糸型 (dimitic)，生成菌糸＋骨格菌糸＋結合菌糸の場合を3菌糸型 (trimitic) として区別している。そして，この性質は菌類の系統発生上，重要な特徴となっている。1菌糸型は最も原始的な型であり，3菌糸型は最も進化した型といえよう。

1菌糸型の菌糸構成をもつ属は *Gyrodontium, Mycorrhaphium, Hericium, Mycoleptodonoides, Odontia, Mycoacia, Basidioradulum, Mucronella* などの各属であり，*Steccherinum, Dentipellis, Laeticorticium, Columnocystis, Veluticeps* および *Stereum* 属の大部分の種類は2菌糸型である。また3菌糸型は，*Fomes, Ganoderma* および *Coriolus* などの白色腐れをおこす属のみに限られている。このことから，セルロース溶解菌には3菌糸型の種類はなく，1菌糸型および2菌糸型の種類のみである。リグニン分解菌では1菌糸型，2菌糸型および3菌糸型のそれぞれ3つの構成菌糸を有する種類が存在する。

b) 担 胞 子

担胞子は球形，だ円形もしくは長だ円形，ときにはソーセージ形のものまであり，大きさもさまざまである。表面は普通平滑であるが，なかには微細なトゲ，イボまたは格子状のしわなど複雑な装飾模様をもつものもある。

前述した各属のうち，*Dentipellis* 属の1種類 (*D. echinospora* Furukawa) および *Echinodontium* 属は胞子に微細なトゲをもつ。また *Ganoderma* 属の胞子は二重の細胞膜をもち，外膜と内膜との間に微細な突起をもっている。これらはいずれもリグニン分解菌である。また前述した属のうち，これらを除いた他の属のもつ胞子は，すべて表面平滑である。表面に複雑な装飾模様をもつ胞子は，平滑で単純な形態のものに比べて，より進化が進んでいるものであって，このような胞子をもつ属は，リグニン分解菌のみに限られている。

c) のう状体および粘のう体

のう状体の形は円筒形の単純なものから紡錘形，棍棒状，先端が尖ったもの，または膨大したものなどがあり，さらに分化が進むとやや厚膜の細胞からなり，表面に結晶をつけたものなどさまざまな形がある。そして多くは生成菌糸の先端が分化して，子実層面上に突出する。粘のう体は細胞中に油性の物質を含む点でのう状体とは区別している。そしてこれらは，種を決定する上で重要な因子となっている。

のう状体をもつものは *Climacodon, Steccherinum, Odontia* および *Echinodontium* 属であり，粘のう体をもつ属は *Hericium* および *Dentipellis* 属である。

のう状体の分化の起点は *Odontia* 属では筆者が分類した第2群および第3群は，子実層の生成菌糸の先端が分化し，その形態は比較的単純である。したがって，のう状体の起点は子実層下部の菌糸である。これに対して *Odontia* 属の第1群および *Climacodon, Steccherinum* 属では，針の軸をなす生成菌糸から分化している。したがって，のう状体の出発点は子実層托（trama）の菌糸である。そしてやや厚膜の細胞からなり，表面に結晶をもつものもある。*Echinodontium* 属ののう状体は骨格菌糸の先端が分化し，発達したものであって，細胞膜は厚く，先端に多くの結晶が付着する。このことから，のう状体をつ属は，もたない属よりも進化の程度は進んでいる仲間である。また，のう状体をもつ属では，単純な形態から複雑な形態へと，また分化の起点が生成菌糸からのものより骨格菌糸からのものへと進化しているものと考えられる。さらに粘のう体をもつ仲間は，のう状体をもつ仲間よりさらに進化したものと考えられるが，なかでも *Dentipellis echinospora* は胞子の性質（微細なトゲをもち，アミロイド性）とあわせ考えると，Hydnaceae のなかではもっとも進化している種といえよう。

II 性因子

ヒダナシタケ目の極性には2極性と4極性のものがあることはよく知られている。そして，4極性のものは2極性のものに比較して，核分裂がより複雑であり，したがってより進化しているものと考えられる。しかし，同担子菌類（Homo basidiomycetes）は4極性から2極性へと進化したとする Raper と Flexer (1971) の見解もある。菌類のうち，2極性は藻菌類から担子菌類にいたる菌類全般にわたって広く知られているが，4極性はわずかに高等な担子菌類と腹菌類についてだけ見出されている。

ヒダナシタケ目については *Fomes fomentarius, Daedaleopsis confragosa, Tyromyces albellus, Lenzites betulina, Coriolus hirsutus, Basidioradulum radula*, および，もっとも進化の進んでいる *Ganoderma applanatum* の各種類はいずれも4極性を示し，*Daedalea heteromorpha, D. variiformis, D. quercina, Fomitopsis pinicola* はそれぞれ2極性である。このように4極性を示す種類は白色腐朽菌であり，2極性を示す種類は褐色腐朽菌である。したがって，4極性を示すリグニン分解菌の方が，2極性を示すセルロース溶解菌よりも進化の程度は進んでいるものと考えられる。

III 酵　素

a) フェノール性物質酸化酵素

木材腐朽菌がもっているフェノール性物質酸化酵素には，ラッカーゼ型とチロシナーゼ型がある。

Gyrodontium, Daedalea, Columnocystis および *Veluticeps* 属などのようなセルロース溶解菌ではチロシナーゼ型のみが存在し，*Climacodon, Mycorrhaphium, Steccherinum, Hericium, Mycoleptodonoides, Odontia, Mycoacia, Dentipellis, Basidioradulum, Laeticorticium, Mucronella, Echinodontium, Fomes, Ganoderma* および *Stereum* の各属などのようなリグニン分解菌では，ラッカーゼ型およびチロシナーゼ型の両者が存在する。リグニン分解菌では菌糸の細胞中に生産されたラッカーゼおよびチロシナーゼのうち，ラッカーゼのみが細胞外に分泌される。チロシナーゼは菌糸の細胞内のみにとどまる。そして菌糸外に分泌されたラッカーゼ反応は Bavendamm 反応として広く知られている。

したがって，リグニン分解菌は2つの型のフェノール性物質の酸化酵素をもつので，チロシナーゼ型のみをもつセルロース溶解菌よりも進化は進んでいるものと考えられる。

b) シュウ酸分解酵素

木材腐朽菌のうちセルロース溶解菌はシュウ酸を蓄積するが，リグニン分解菌では蓄積しない。これは生産されたシュウ酸がシュウ酸脱炭酸酵素により分解されるからである。そしてこのシュウ酸分解酵素はリグニン分解菌のみが持っており，セルロース溶解菌には存在しない。このように，シュウ酸分解酵素をもつリグニン分解菌は，それをもたないセルロース分解菌よりも進化の程度は進んでいるものとおもわれる。

c) アミロシンテアーゼ

担子菌類の胞子に産生するとおもわれているもので，成熟した胞子のみが IK 溶液により陽性の反応を

示す。この酵素は *Hericium, Dentipellis* および *Echinodontium* 属などのリグニン分解菌のみに知られている。このように，特殊な酵素であるアミロシンテアーゼをもつリグニン分解菌は，もたないセルロース溶解菌よりも進化しているものと考えられる。また，白色腐朽をおこす Hydnaceae の中では，アミロシンテアーゼをもつ *Hericium, Dentipellis* および *Echinodontia* 属は，もたない *Climacodon, Mycorrhaphium, Mycoleptodonoides, Odontia, Mycoacia* および *Basidioradulum* の各属よりも，なお一層進化の進んでいる属といえよう。

以上の形態，性因子，生理的性質（酵素）の重要な性質から検討すると，リグニン分解菌はセルロース溶解菌よりも，より複雑な性質あるいは物質をもっていることがわかる。したがって，リグニン分解菌はセルロース溶解菌よりも，一層進化の進んだものということができる。このことは地球上に緑色植物が出現した過程の中で，1年生草木よりもリグニンをもった多年生の樹木が比較的後期に出現した事実と合わせ考えても，容易に理解できるところである。

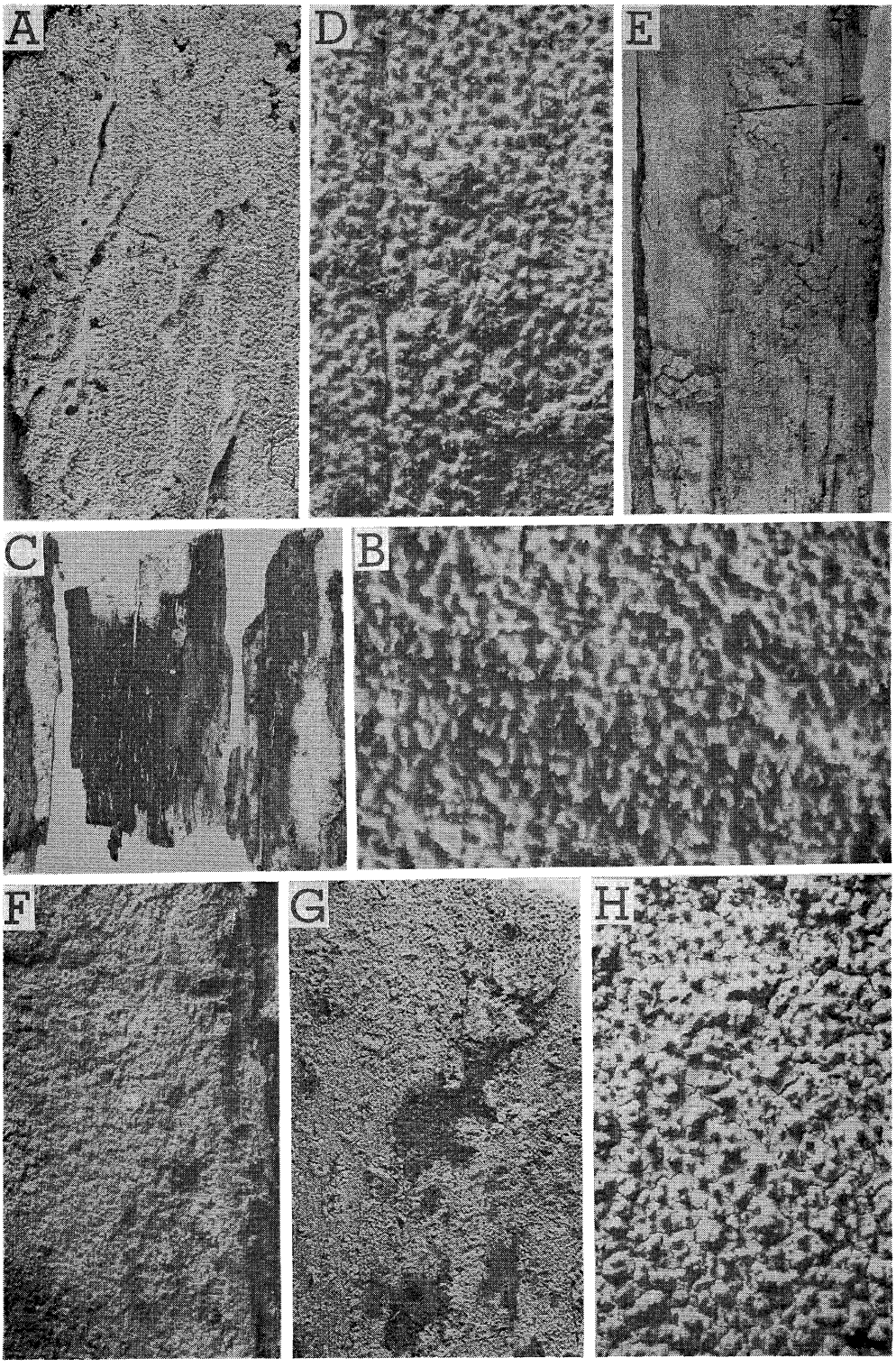
このように，本項でとりあげた Friesian system の Hydnaceae, Polyporaceae および Stereaceae では，子実体の菌糸の組成からみて，きわめて単純な性質をもつ属は Hydnaceae に多い。しかし，*Steccherinum, Dentipellis* および *Echinodontium* 属は2菌糸型の菌糸組成をもつので，例外的な属といえる。

筆者が本報告であつかった Hydnaceae に属する各属は形態もしくは性質が比較的単純であることから，Hydnaceae のなかでも，最も進化の程度の低い仲間であるとおもわれる。*Odontia, Mycoacia, Dentipellis* および *Basidioradulum* の各属のうちで，もっとも単純な性質をもつのは *Mycoacia* 属である。そして，子実層の生成菌糸の先端が分化して，のう状体を形成するようになったものが *Odontia* 属であろう。*Odontia* 属のうち筆者がグループ分けした第2群に属する種類は，第1群に比べて単純な構成であることから，むしろ第1群は第2群よりもやや分化が進んだ仲間といえよう。一方 *Mycoacia* 属の子実体にロー質の性質が加わり，さらに針の形態が，イボ状あるいは歯牙状に変わったものが *Basidioradulum* 属ではないかと考えられる。このことは両属の菌糸構成が1菌糸型であり，のう状体をもたないという共通の性質をもつことからも推察できる。そして，*Odontia* 属の第3群（*O. spathulata*）は，筆者は *Odontia* 属としてあつかったが，のう状体の分化の程度がきわめて弱いこと，および子実体がややロー質をおびていることの2点で，*Odontia* 属と *Basidioradulum* 属の中間的な存在ではないかとおもわれる。

Dentipellis 属は子実体を構成する菌糸の組成が2菌糸型で，粘のう体をもち，胞子がアミロイド性であることから，きわめて複雑な性質をもっている。これらの性質から *Odontia, Mycoacia* および *Basidioradulum* の各属よりなお一層進化の進んだ仲間といえる。

Laeticorticium 属は子実層が完全な針の形態をとっていない点で Corticiaceae においた。系統的には *Corticium* 属と同一系統上にあるが，子実層に細い枝分れをした鹿角状菌糸をもつ点からみれば，*Corticium* 属よりやや進化した仲間といえる。

Mucronella 属は完全な針の形態をとっているが，単純な菌糸構成をもち，しかも菌糸の性質が膨潤であるという大きな特徴があるので，Corner (1950) の意見にしたがって *Clavariaceae* においた。しかし，針が常に下方に向かって伸長する性質（向地性）は，Hydnaceae の持つ最も基本的な性質であるようにおもわれる。したがって，Hydnaceae と Clavariaceae の両者の性質をかねそなえている属といえよう。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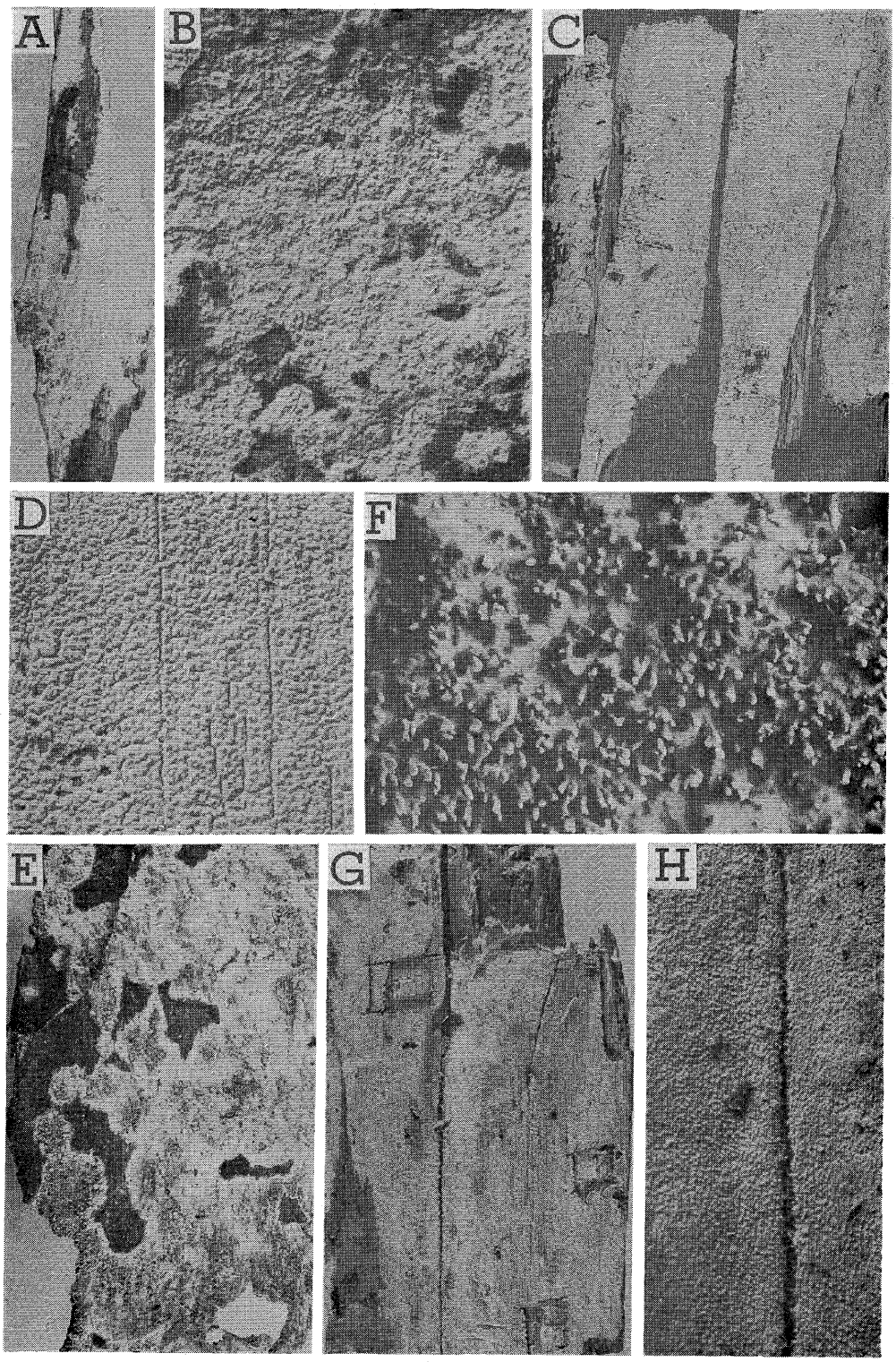
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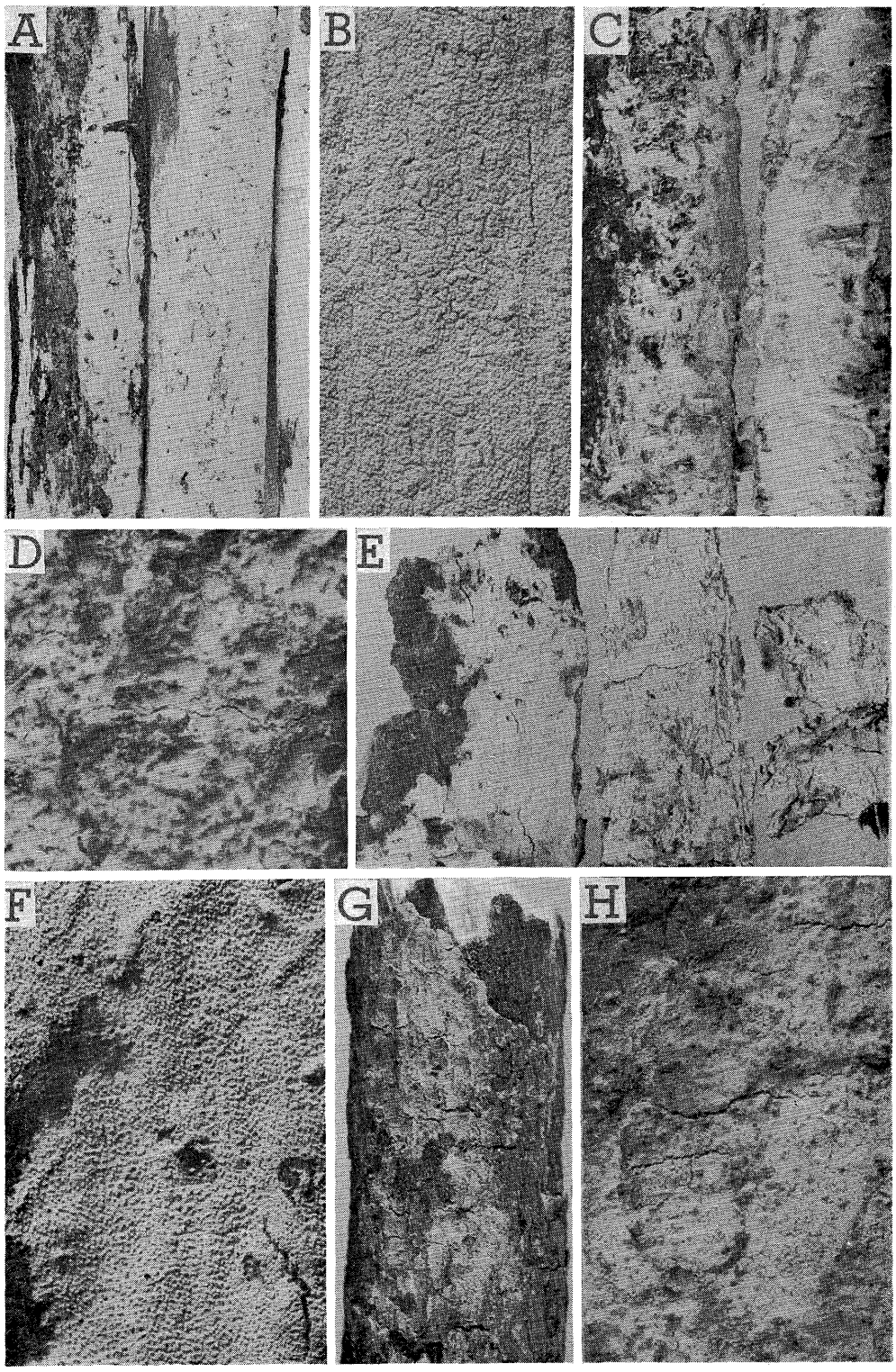
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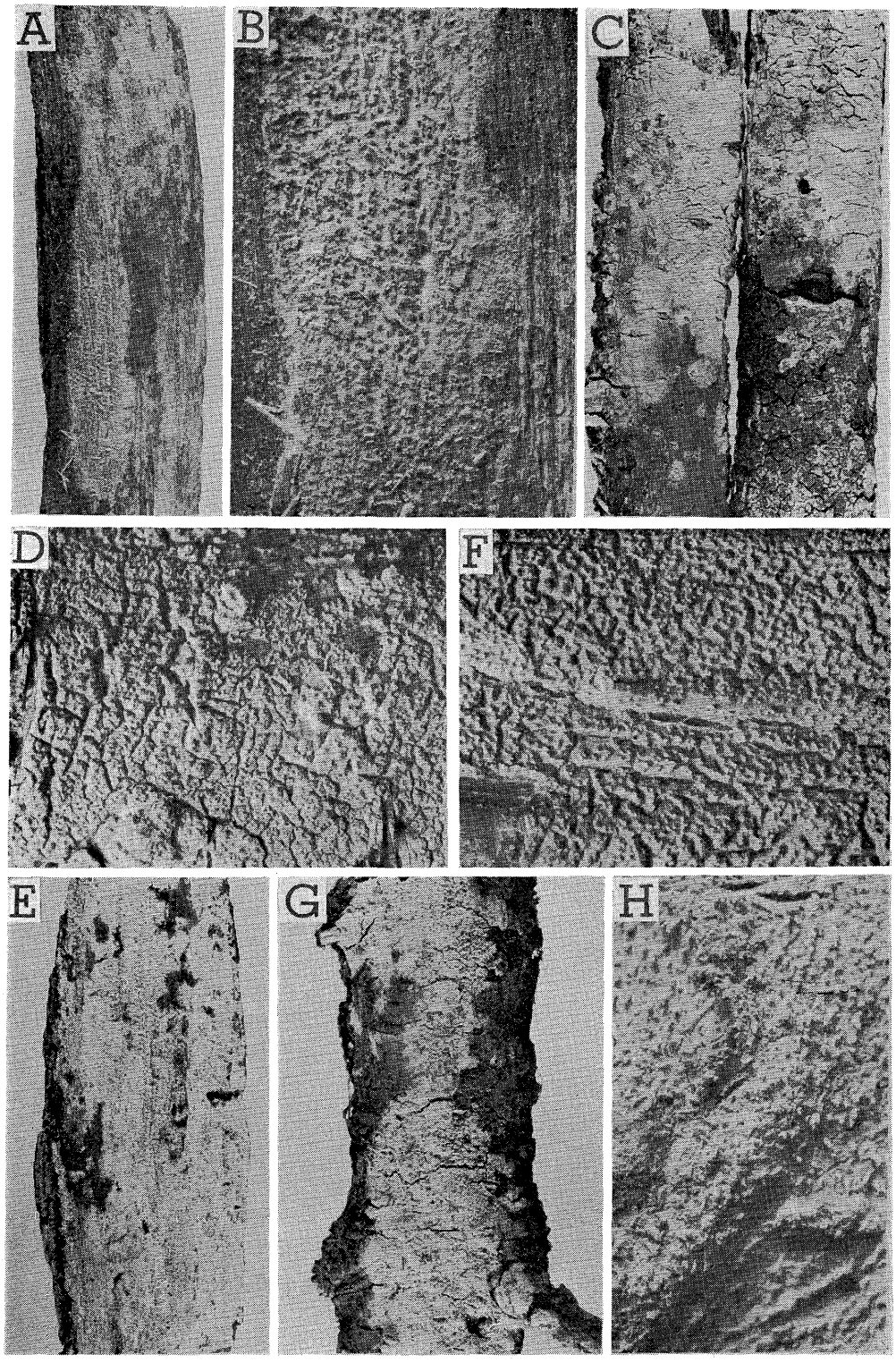
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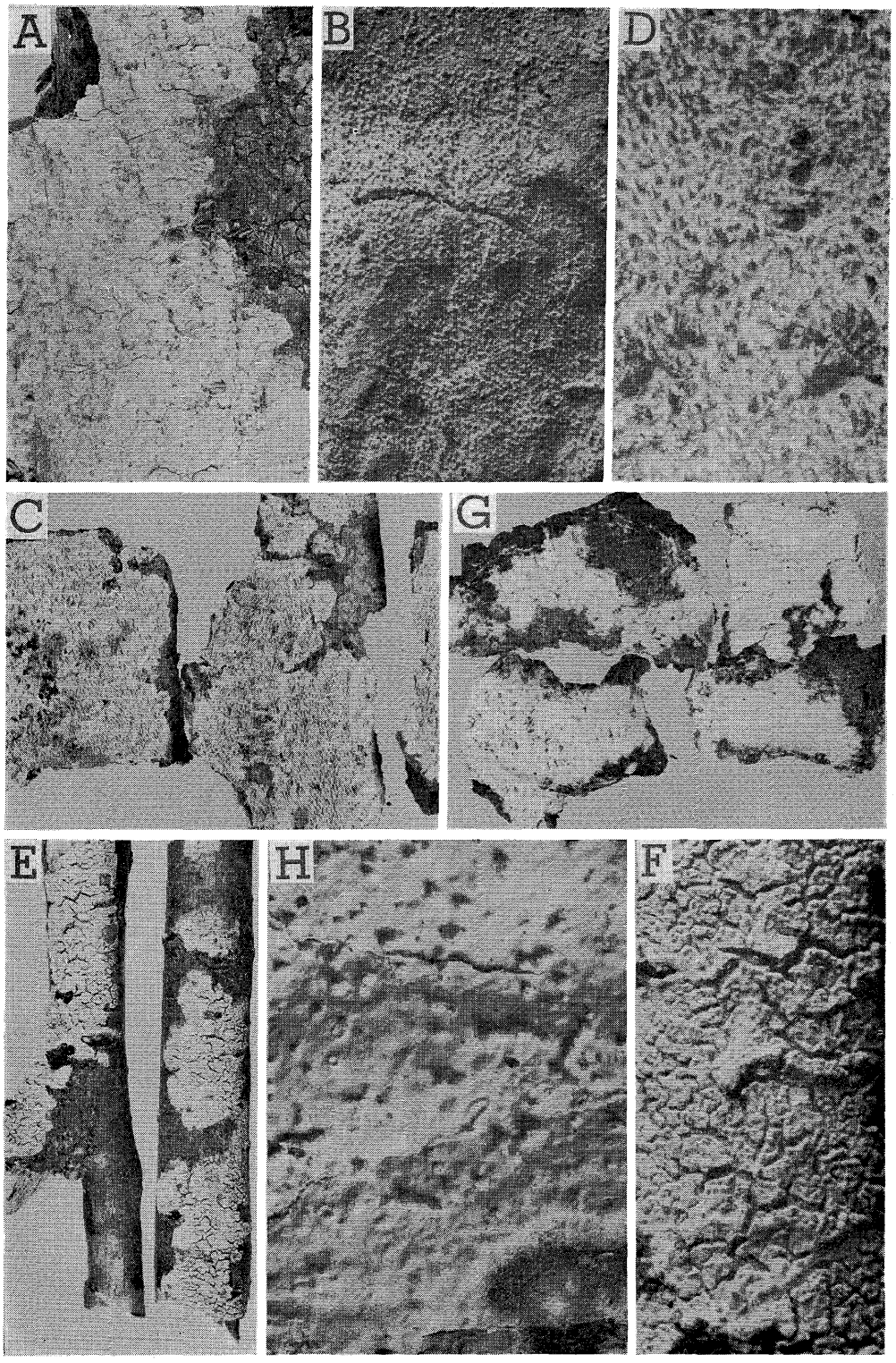
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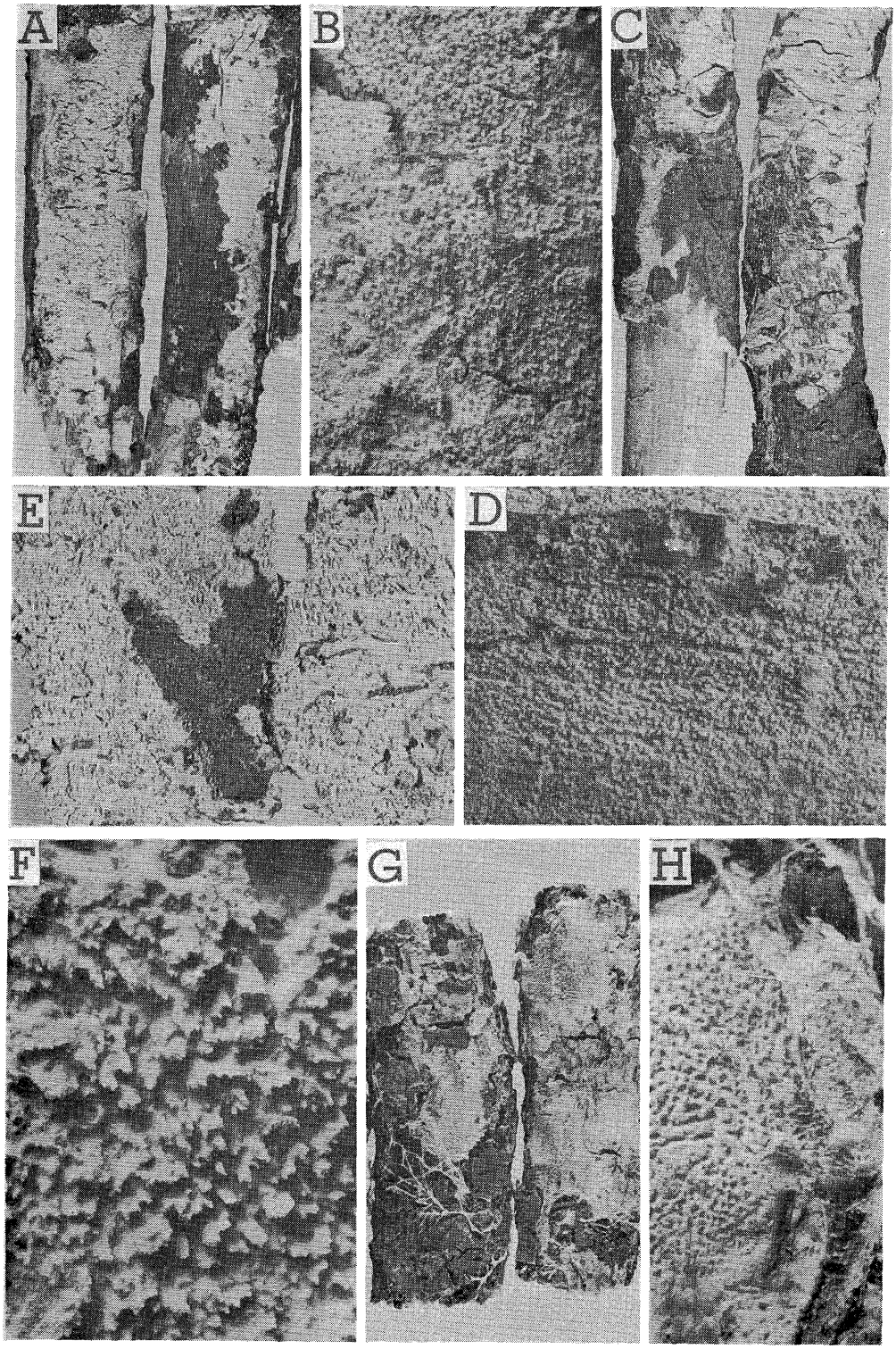
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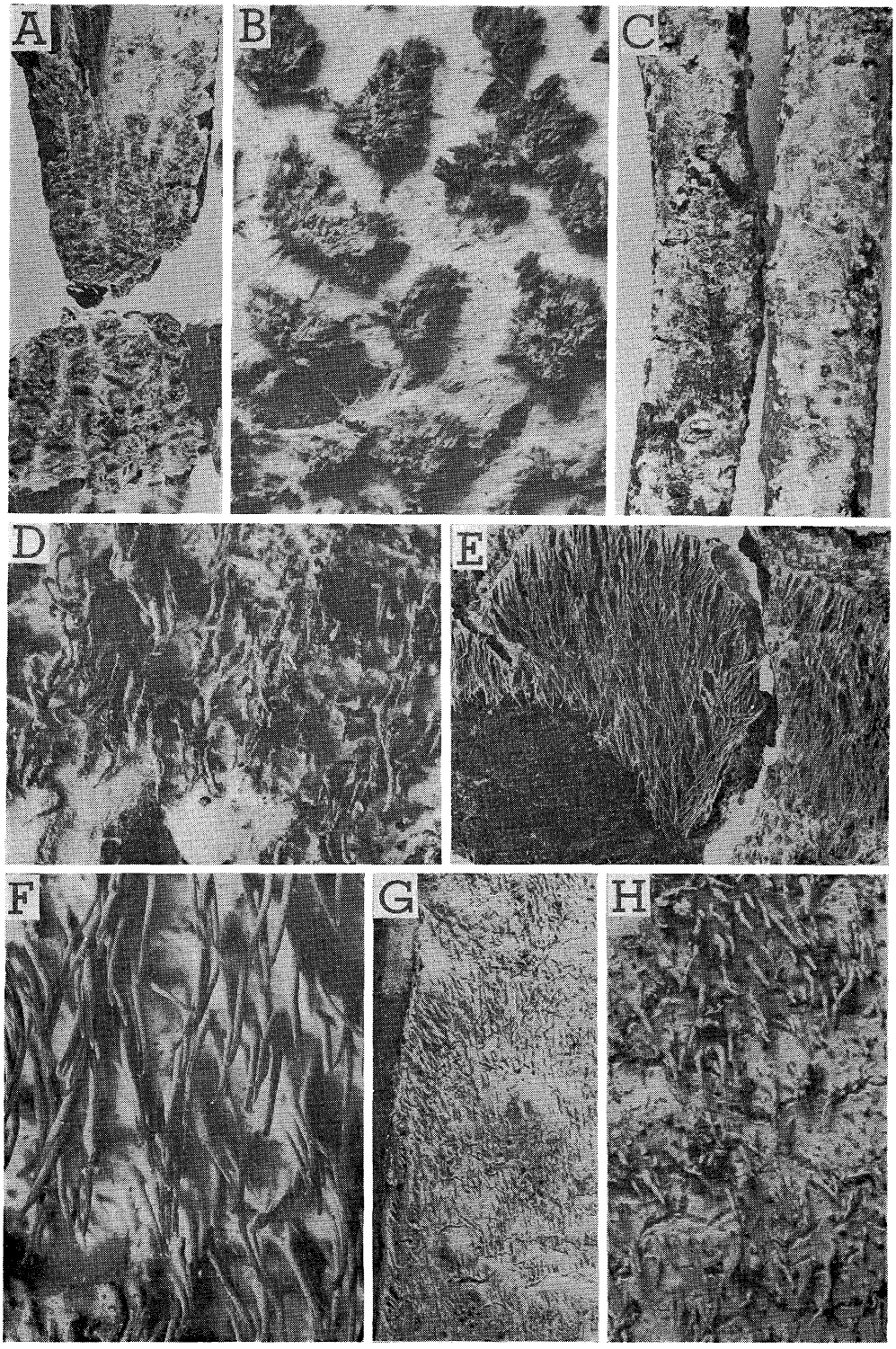
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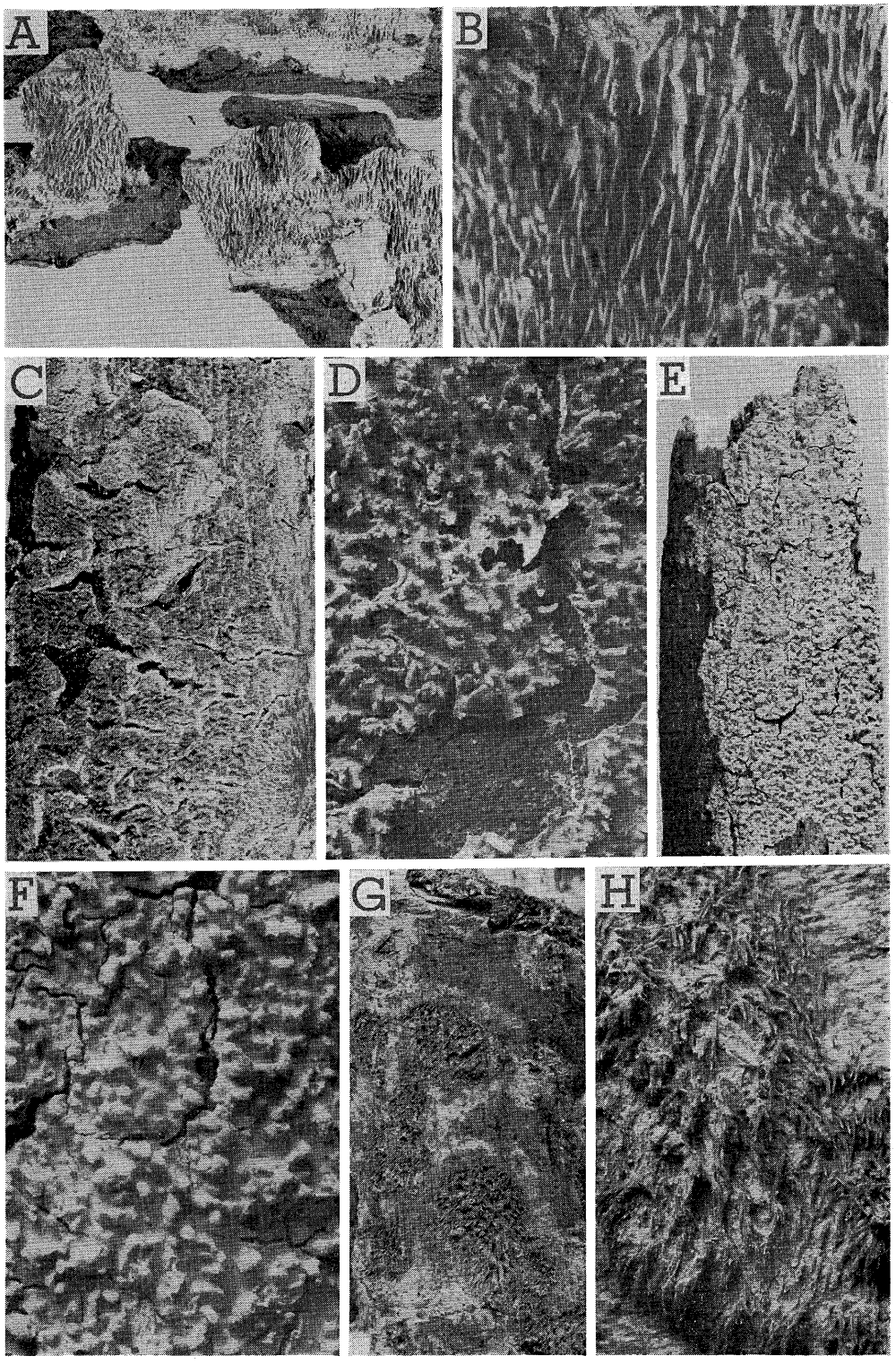
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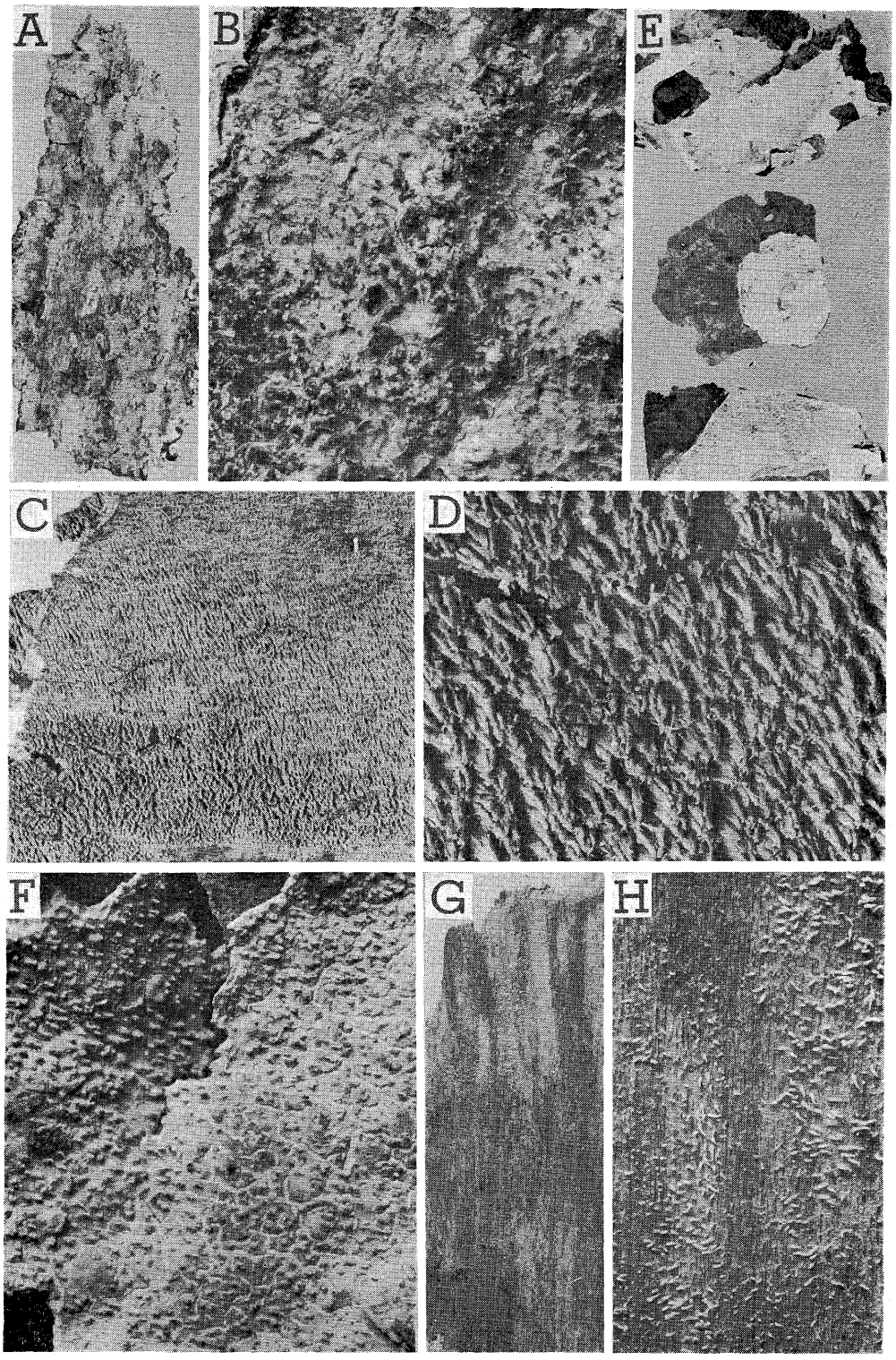
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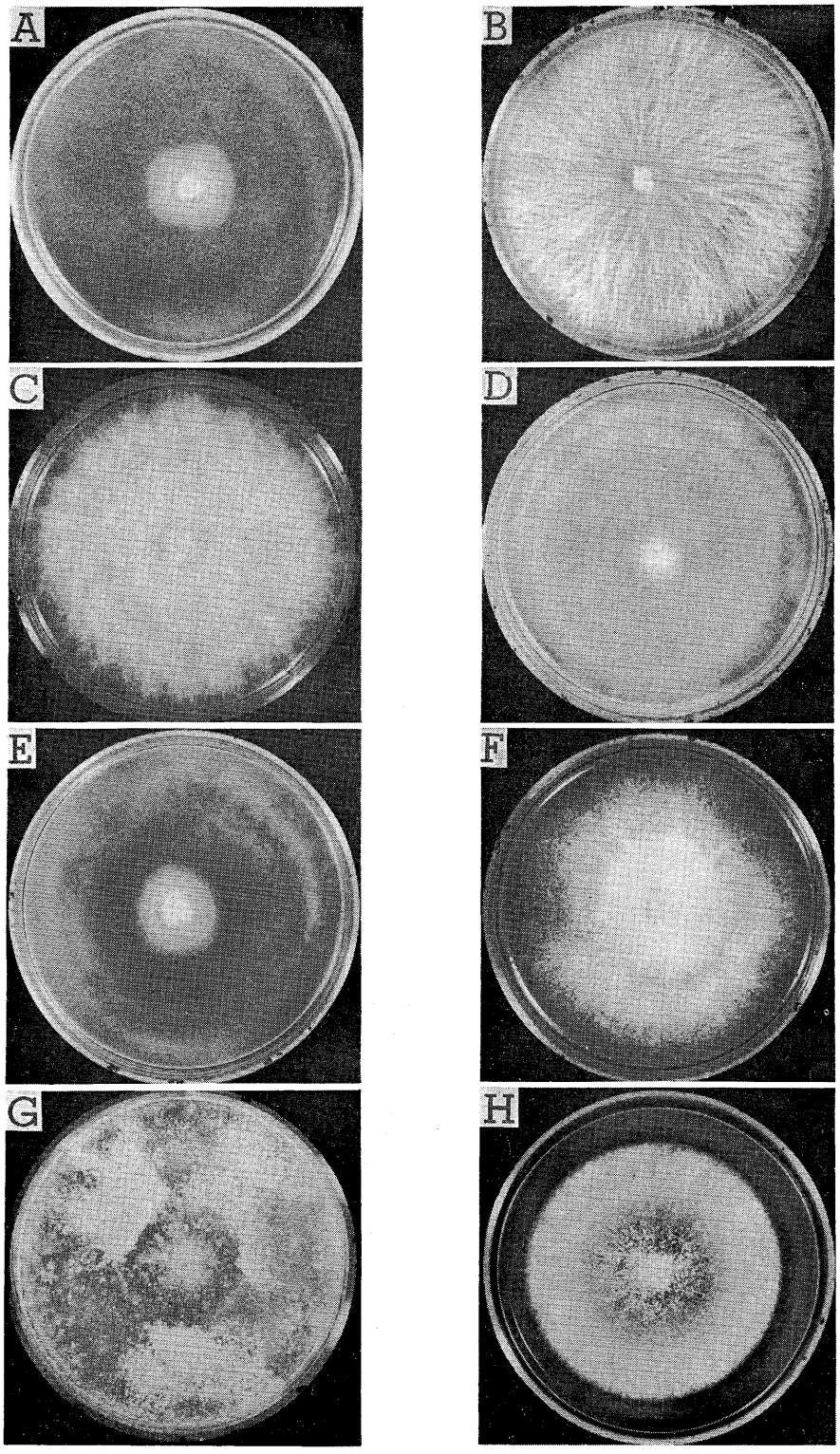
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