



# HOKKAIDO UNIVERSITY

Title	GEOGLOSSACEAE JAPONIAE
Author(s)	IMAI, Sanshi
Citation	Journal of the Faculty of Agriculture, Hokkaido Imperial University, 45(4), 155-264
Issue Date	1941-10-30
Doc URL	<a href="https://hdl.handle.net/2115/12738">https://hdl.handle.net/2115/12738</a>
Type	departmental bulletin paper
File Information	45(4)_p155-264.pdf



# GEOGLOSSACEAE JAPONIAE

auctore

Sanshi IMAI

Cum 6 figulis in scripto et 5 tabulis

The family Geoglossaceae is a small but quite characteristic one. The majority of the species grow in damp or moist habitat, and are to be found most commonly in low wet woods or swamps or on the shady slopes of ravines. About three-quarters of the species of this family are clavate in outline, with a general resemblance to some species of *Clavaria* and usually somewhat flattened or compressed. The rest of them are pileate. About half of the species are light in color, while the remainder are dark or black.

Although the light colored fungi are striking to the eyes, they are usually small or minute in size, and usually less than 5 cm. in length, and the dark or black colored ones are usually hard to be distinguished in color from the ground or fallen branches or leaves, and also small in size. Moreover they are usually very short in their life and some are easily decayed within a few days.

For this reason, the Geoglossaceous fungi are very easily overlooked in collection. They are also influenced greatly by climatic conditions and other environmental factors in respect to their growth and development. It is not rare that a species which had an abundant occurrence in a certain habitat in one season becomes almost undiscoverable in the next season. Accordingly, there are very many difficulties in the collection as well as in the accurate and conclusive study of the members of this family.

The fungi of this family, in nature, are usually highly variable in form, and the majority of them, except the group of the Tribe Geoglosseae, are extremely variable in color, size and form, especially when dried or preserved. The description which was derived from partly or completely dried material not only less well interprets the real characters of the fungus, but often causes an unavoidable confusion. The preserved material of this

group should, therefore, be accompanied by carefully prepared notes regarding the color and form of living fresh plants.

The writer has carried on the collection and study of the fungi of the present family during the past fifteen years. Fortunately, he could have rich material in fresh condition during the course of this study from various localities in our country.

In the world, about thirty genera and two hundred and twenty species have been hitherto reported as members of this family, but among them there are many genera and species which should be considered as synonymous or be excluded from this family and also there are many doubtful or uncertain species.

In North America, where the study of the Geoglossaceous flora has been most extensively carried out, forty one species and five forms have hitherto been validly reported.

In Europe, about one hundred and fifteen species have been reported, in which, however, many excluded and doubtful species are included. Among them about forty three species seem to have validity.

In our country, the first report of the fungus in this family was that of the late A. YASUDA who reported *Mitrula phalloides* CHEV. in plate XVIII of MATSUMURA and MIYOSHI's *Cryptogamae Japonicae Iconibus Illustratae* in 1899, and *Spathularia clavata* (SCHAEFF.) SACC. in plate XLIX in the same publication, in the next year. After this time, up to 1932, the time of the present writer's first report, eight genera and twenty species and one form were reported fragmentarily by several authors, viz. A. YASUDA, P. HENNINGS, C. G. LLOYD, S. KAWAMURA and others, amongst which, however, seven synonymous species and an excluded one were included. In the present paper, the writer reports thirty seven species, three varieties and thirteen forms.

Since the Japanese Geoglossaceous flora is so closely related to that of other regions, especially to North America more than to Europe, comparative studies of the material with that of those countries becomes needful. For this purpose the writer was able to make a comparative study of the Japanese material with the following type or authentic specimens preserved in the Herbaria mentioned below:

From Cornell University, Ithaca, N. Y., U. S. A.:

*Corynetes robustus* DURAND. (cotype).

*Geoglossum alveolatum* DURAND. (a part of type).

*Geoglossum cohaerens* DURAND. (a part of type).

*Geoglossum fallax* DURAND. (a part of type).

- Geoglossum intermedium* DURAND. (a part of type).  
*Gloeoglossum affine* DURAND. (type collection).  
*Leptoglossum latum* PECK. (type collection).  
*Microglossum fumosum* DURAND. (authentic specimen).  
*Microglossum longisporum* DURAND. (a part of type).  
*Trichoglossum confusum* DURAND. (a part of type).  
*Trichoglossum hirsutum* f. *variabile* DURAND. (cotype).  
*Trichoglossum tetrasporum* SIND. et FITZP. (a part of type).  
*Trichoglossum Wrighti* DURAND. (cotype).

From the New York Botanical Garden:

- Geoglossum tremellosum* PECK. (a part of type).  
*Microglossum alabamense* UNDERW. (a part of type).

From the Botanical Museum, Uppsala, Sweden:

- Clavaria nigrita* FR. (a part of type).  
*Geoglossum Cookeianum* NANNF. (cotype).  
*Geoglossum montanum* NANNF. (cotype).  
*Geoglossum Starbäckii* NANNF. (cotype).

The writer had also the privilege of the loan of the material of this group by the Rijks Herbarium of Leiden, comprising one hundred and seventy specimens of Europe and some of North America, and also by the Botanical Museum, Oslo, Norway, comprising forty three specimens of the Norwegian fungi.

Furthermore, from the following Herbaria and Institutions, the writer obtained a large number of specimens in exchange. In consequence it was possible to determine the species more accurately.

1. Dept. of Plant Pathology, New York State College of Agriculture, at Cornell University, Ithaca, N. Y., U. S. A.
2. Farlow Herbarium, Harvard University, Cambridge, Mass., U. S. A.
3. Herbarium of the University of North Carolina, Chapel Hill, N. C., U. S. A.
4. Pathological and Mycological Collections, Bureau of Plant Industry, U. S. Dept. of Agriculture, Washington, D. C., U. S. A.
5. Mycological Herbarium, The New York Botanical Garden, New York City, U. S. A.
6. Naturhistoriska Riksmuseet, Stockholm, Sweden.
7. Botaniska Museet, Uppsala, Sweden.
8. Herbarium of S. KILLERMANN, Aegidplatz, Regensburg, Bayern, Germany.
9. Herbarium of W. KIRSCHSTEIN, Berlin, Germany.

Before proceeding, the writer wishes to express here his cordial thanks to Prof. Emer. KINGO MIYABE and Prof. SEIYA ITO for their kind advices, and to Prof. YOSHIHIKO TOCHINAI for his kind encouragement. Further to the directors or curators of the Herbaria and Institutions mentioned above, as well as to the gentlemen who have sent specimens to the writer, the writer wishes to express his hearty thanks for the courtesies so generously and cordially extended, especially to Dr. J. H. H. v. d. MEER, of the Rijks Herbarium, Leiden, Holland, and to Dr. I. JØRSTAD, of the Oslo Botanical Museum, Norway, for the kind loan of numerous specimens, as well as to Dr. H. M. FITZPATRICK, Professor of Cornell University, for generously sending the fragments of the type and authentic specimens preserved in the Herbarium of his Institution, and to Prof. J. A. NANNFELDT, of the Botanical Museum of Uppsala, for generously sending the authentic or cotype specimens of his new species and the fragment of FRIES' type specimen, and for his kind information regarding the species of northern Europe.

### Geoglossaceae SCHROET.

- Ordo *Clavati* FR. Syst. Myc. I, 2 et 461, 1821, pro parte.  
*Mitrati* FR. Ibid. I, 2, 1821, et II, 3, 1823, pro parte.  
*Elvellacei* Trib. *Mitrati* FR. Syst. Orb. Veg. I, 84, 1825, pro parte.  
*Elvellacei* Trib. *Claviculares* FR. Ibid. 86, 1825; pro parte.  
*Clavati* Trib. *Mitruini* FR. Ibid. 89, 1825.
- Fam. *Geoglosseae* CORDA, Icon. Fung. II, 35, 1838; V, 37, 1842.  
*Helvellaceae* CORDA, Ibid. II, 36, 1838; III, 37, 1839, (non 1842).  
*Leotiaceae* CORDA, Ibid. V, 37, 1842.
- Ordo *Helvellacei* FR. Summa. Veg. Scand. 346, 1849, pro parte—FUCK. Symb. Myc. 332, 1869, pro parte—CKE. Mycogr. I, 247, 1879, pro parte.  
*Bulgariacei* FR. Ibid. 357, 1849, pro min. parte—FUCK. Symb. Myc. 282, 1869, pro min. parte.
- Fam. *Geoglosei* BONORD. Handb. Allgem. Myk. 206, 1851, pro maj. parte.  
Fam. *Helvellacei* BONORD. Ibid. 207, 1851, pro parte.  
*Elvellacei* BERK. Outl. Brit. Fung. 358, 1860, pro parte.  
*Bulgariactes* KICKX, Fl. Crypt. Flandr. I, 499, 1867, pro parte.  
*Geoglossées* KICKX, Ibid. 500, 1867—GILL. Disc. Fr. 21, 1879.  
*Helvellaceae* KARST. Myc. Fenn. I, 25, 1871, pro parte—PHILLIPS, Brit. Disc. I,

1887, pro parte.

*Helvelleae* SACC. Consp. Gen. Disc. in Bot. Centralbl. XVIII, 213, 1884, pro parte—  
MASS. Brit. Fung. Fl. IV, 455, 1895, pro parte.

Trib. *Clavules* BOUD. Bull. Soc. Myc. Fr. I, 109, 1885.

Fam. *Geoglossés* BOUD. Ibid. I, 109, 1885.

*Leotiés* BOUD. Ibid. I, 109, 1885.

*Helvelei* QUÉL. Ench. Fung. 265, 1886, pro parte.

Subf. *Geoglosseae* SACC. Syll. Fung. VIII, 8, 1889.

Fam. *Geoglossacei* SCHROET. Pilze Schles. II, 16, 1893.

***Geoglossaceae*** SCHROET. in ENGLER & PR. Nat. Pfl. Fam. I, 1, 163, 1894—SEEVER,  
Bull. Lab. Nat. Hist., State Univ. Iowa, V, 251, 1904—DURAND, Ann. Myc. VI, 387, 1908—  
NANNF. Morph. Syst. Disc. 73 & 314, 1932—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII,  
144, 1932.

*Geoglosseae* REHM, Pilze Deut., Hyst. & Disc. 1142, 1896.

*Geoglossacées* BOUD. Hist. Class. Disc. Eur. 85, 1907.

*Leotiaceés* BOUD. Ibid. 87, 1907.

Ascoma stipitatum, erectum, clavatum, capitatum, spathulatum, coralloideum vel pileatum, teretum vel compressum, carnosum, gelatinosum vel ceraceo-carnosum; pars ascigerens terminata, a stipite delimitata vel non-delimitata. Asci cylindranei, clavato-cylindranei vel clavati, 2–8-spori, inoperculati; spora subglobosae, late ellipsoideae, longe ellipsoideae, breve fusoideae, longe fusoideae, cylindraneae, aciculares, clavato-filiformes, continuae vel 1–multiseptatae, hyalinae vel coloratae; paraphyses nullae vel praesentes, forma variabiles, hyalinae vel coloratae.

Typus: *Geoglossum* PERS. ex FR.

Similarly to the other larger fungi, the Geoglossaceous fungi had also been mainly classified by the macroscopic features from the Persoonian and Friesian periods until the last part of the XIX Century. In 1884 and 1889, P. A. SACCARDO proposed a new system for the classification of Discomycetes by the spore-characters. In 1885 and in 1907, E. BOUDIER also proposed his new system with special reference to the microscopic features for the classification of the fleshy Discomycetes.

The names Geoglosseae and Leotiaceae were used for the first time by A. C. I. CORDA in distinguishing from Helvellaceae FR. sensu CORDA. But, Geoglossaceae in the present strict sense was given by J. SCHROETER in 1893 and 1894, and he placed the family, mainly characterized by the clavate, capitata or pileate and stipitate ascophores and by having the inoperculate asci, in the Order Helvellineae which was characterized by a

gymnocarpous discocarp, together with Helvellaceae and Rhizinaceae. He divided the family into two groups, Mitrulei and Cudoniæi in 1893; but Geoglossei and Cudoniæi in 1894, by the macroscopic features.

Before these publications by SCHROETER, in 1885, it had been proposed by E. BOUDIER, as mentioned above, to divide the fleshy Discomycetes into two divisions, Operculés and Inoperculés, and to divide further the first tribe Clavules of the latter Division, Inoperculés, into two families, Geoglossés and Leotiés.

In 1896, H. REHM divided the family Geoglosseae into two tribes, Eugeoglosseae and Leotieae.

In 1908, in his excellent paper, the Geoglossaceae of North America, DURAND divided the family into two subfamilies of Geoglosseae and Cudoniæae.

In 1932, the writer, in collaboration with Prof. S. ITO, divided the family into three subfamilies, Geoglossoideae, Hemiglossoideae and Cudonioideae.

All of these authors have primarily divided the Geoglossaceous fungi into two or three groups or subfamilies according to the outer morphological characters, which the writer also considers to be reasonable for the taxonomy of the present family.

The writer proposes three subfamilies for the Japanese Geoglossaceae.

#### Clavis Subfamiliae Geoglossacearum Japoniae.

- I. Ascoma clavatum, capitatum, spathulatum, saepe compressum, numquam pileatum .....  
..... Geoglossoideae.
- II. Ascoma pileatum ..... Cudonioideae.
- III. Ascoma coralloideum, ramosum vel subsimplex; hymenium unilaterale ... Hemiglossoideae.

#### Subfam. Geoglossoideae S. ITO et IMAI

*Geoglosseae* (ut Fam.) CORDA, Icon. Fung. II, 35, 1838; V, 37, 1842.

*Leotiaceae* (ut Fam.) CORDA, Ibid. V, 37, 1842, pro parte.

*Geoglossei* (ut Fam.) BONORD. Handb. Allgem. Myk. 206, 1851, pro maj. parte.

*Geoglossées* (ut Fam.) KICKX, Fl. Crypt. Flandr. I, 500, 1867.

*Mitruleae* (ut Subf.) KARST. Myc. Fenn. I, 27, 1871.

*Geoglossés* (ut Fam.) BOUD. Bull. Soc. Myc. Fr. I, 109, 1885.

*Mitrulei* SCHROET. Pilze Schles. II, 17, 1893.

*Geoglossei* SCHROET. in ENGLER & PR. Nat. Pfl. Fam. I, 1, 163, 1894, pro maj. parte.

*Eugeoglosseae* REHM, Pilze Deut., Hyst. & Disc. 1142, 1896.

*Geoglossacées* (ut Fam.) BOUD. Hist. Class. Disc. Eur. 85, 1907.

*Leotiacées* (ut Fam.) BOUD. Ibid. 87, 1907, pro parte.

*Geoglosseae* DURAND, Ann. Myc. VI, 396, 1908.

***Geoglossoideae*** S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 144, 1932—IMAI, Ann. Myc. XXXVIII, 268, 1940.

Ascoma stipitatum, rectum, clavatum, capitatum, spathulatum, saepe compressum, numquam pileatum; cetera ut in Familia.

Typus: *Geoglossum* PERS. ex FR.

According to the spore-character, it is possible to divide the members of this subfamily into three tribes, namely Mitruleae, Spathulariae and Geoglosseae.

The spores of the first tribe are hyaline, globose to cylindrical in shape, and *Ascocorynium*, *Mitrula*, *Gymnomitrula*, *Scleromitrula* and *Microglossum* are included in this tribe. The second tribe has scolecospores, and *Spathularia* is included, while the spores of the last tribe, Geoglosseae, are dark in color, and *Phaeoglossum*, *Geoglossum*, *Trichoglossum* and *Gloeoglossum* are included in this tribe.

The writer formerly, in 1932, proposed that Geoglossoideae be divided by the color of ascophore into the two tribes, Laetoglosseae and Phaeoglosseae, but into Mitrulcae and Geoglosseae in 1940. It, however, seems now to be no primarily essential character for the classification of the tribe, as mentioned under the genus *Microglossum*.

#### Clavis triborum generiumque Geoglossoidearum.

##### I. Sporae hyalinae.

- A. Sporae subglobosae, ellipsoideae, fusoideae vel cylindraceae; ascoma capitatum vel clavatum ..... Mitruleae.
  - 1. Sporae late ellipsoideae oblongaeve, breve fusoideae vel longe ellipsoideae vel fusoideae, continuae, rarissimo uniseptatae.
    - a. Paraphyses nullae; sporae late ellipsoideae ..... *Ascocorynium*.
    - b. Paraphyses praesentes.
      - i. Sclerotia nullae.
        - α. Ascoma hemiangiocarpum; clavula in apice stipitis discreta ..... *Mitrula*.
        - β. Ascoma gymnocarpum; clavula apicem stipitis ambiente ..... *Gymnomitrula*.
      - ii. Sclerotia praesentes ..... *Scleromitrula*.
  - 2. Sporae longe fusoideae vel cylindraceae, demum bi- vel multiseptatae ..... *Microglossum*.

- B. Sporae aciculares vel clavato-filiformes; ascoma spathulatum ..... Spathulariae.  
 ..... *Spathularia*.
- II. Sporae coloratae; ascoma clavatum vel subcapitatum ..... Geoglosseae.
- A. Ascoma siccum, non viscosum; paraphyses in stipite vulgo nullae.
1. Setae in ascomate nullae ..... *Geoglossum*.
  2. Setae in ascomate praesentes ..... *Trichoglossum*.
- B. Ascoma viscosum; paraphyses in stipite praesentes ..... *Gloeoglossum*.

Trib. **Mitruleae** (KARST. p. p.) IMAI, emend.

*Laetoglosseae* S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 144, 1932, nom. seminud.

*Mitruleae* IMAI, Ann. Myc. XXXVIII, 268, 1940.

Ascoma capitatum vel clavatum, maxima parte laete coloratum, in parte atratum. Sporae hyalinae, subglobosae, late ellipsoideae, ellipsoideae, fusioideae vel cylindratae; cetera ut in Subfamilia.

Typus: *Mitrula* PERS. ex FR.

**Ascocorynium** S. ITO et IMAI

*Spragueola* MASS. Journ. Bot. XXXIV, 144, 1896; Ann. Bot. XI, 295, 1897, in exemplario monstroso.

**Ascocorynium** S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 145, 1932, nom. seminud.

—IMAI, Trans. Sapporo Nat. Hist. Soc. XIII, 179, 1932, cum diagn.

*Geoglossum* Auct. pro parte.

*Mitrula* Auct. pro parte.

*Microglossum* Auct. pro parte.

Ascoma carnosum, erectum, stipitatum, plerumque lanceolatum, clavatum vel subcylindraceum, raro monstrosum; clavula plerumque ellipsoidea, clavata vel subcylindracea, raro monstrosa, laete colorata (vitellina), basi a stipite valleculo angusto distincto albo discreta. Asci clavato-cylindratici vel cylindratici, inoperculati, octospori; sporae late ellipsoideae, brevi fusioideae, raro subreniformes, continuae, hyalinae, leves, monostichae vel subdistichae; paraphyses nullae.

Typus: *Geoglossum irregulare* PECK.

Etym. Ascos + coryne + ium.

The presence or absence of the paraphyses in the hymenium is an essential criterion in the classification of the genera, by which the present genus is separated from *Mitrula* proper.

The type species, *Geoglossum irregulare* PK. has no paraphyses, as noticed by DURAND.

To *Mitrula vitellina* (BRES.) SACC., BRESADOLA ascribed the filiform paraphyses which were rarely present, and subsequent several authors followed this description. DURAND, however, denied it after a careful examination of BRESADOLA's and American specimens, and the writer has also detected the same fact in the Japanese one. The species also belongs clearly to this genus.

The genus *Spragueola* was described by MASSEE basing upon an abnormal and monstrous specimen of *G. irregulare* PK. According to Article 65 of the International Rules of Botanical Nomenclature, edition 3, the name *Spragueola* is not a valid one for the genus, and should be discarded.

As far as the writer is aware, the species of this genus are only two, *A. irregulare* (PK.) S. ITO et IMAI and *A. vitellinum* (BRES.) S. ITO et IMAI, and the former species has not yet been collected in Europe.

Relating to the distribution of species, the two are clearly delimited under the opposite phytogeographic distribution. The boundary of their distribution is around the 37–38° of North Latitude in North America, and around 35–36° in Japan. *A. irregulare* distributes in the northern part from this boundary, on the contrary *A. vitellinum* in the southern.

In Europe, *A. vitellinum* seems to have only been distributed in South Tyrol of northern Italy.

#### Clavis speciorum.

1. Ascoma fere irregularis contortumque, majus; sporae 6–10 × 4–5 μ ..... *A. irregulare*.
2. Ascoma fere regulare clavatum, minus; sporae 4–8 × 3–4 μ ..... *A. vitellinum*.

#### *Ascocorynium irregulare* (PECK) S. ITO et IMAI

*Mitrula crispata* (non FR.) BERK. Grev. III, 149, 1875 (teste MASSEE).

*Geoglossum irregulare* PECK, 32 Ann. Rep. N. Y. State Mus. 45, 1879.

*Mitrula luteola* ELLIS, Amer. Natur. XVII, 192, 1883 (teste DURAND)—SACC. Syll. Fung. X, 1, 1892—MASS. Ann. Bot. XI, 274, t. 12, f. 23–24, 1897—REHM, Ann. Myc. II, 32, 1904.

*Geoglossum vitellinum* (non BRES.) PECK, 2<sup>d</sup> Bull. N. Y. State Mus. 28, t. 1, f. 5–7, 1887.

*Mitrula vitellina* (BRES.) SACC. var. *irregularis* SACC. Syll. Fung. VIII, 36, 1889—PECK, 48 Ann. Rep. N. Y. State Mus. 130, t. 5, f. 8–14, 1896—BURT, Rhodora, I, 65, 1899.

*Spragueola americana* (in exemplario monstroso) MASS. Journ. Bot. XXXIV, 144, t. 357, f.

8-9, 1896; Ann. Bot. XI, 295, t. 13, f. 74-76, 1897 (teste DURAND)—SACC. Syll. Fung. XIV, 742, 1899.

*Mitula irregularis* DURAND, Ann. Myc. VI, 398, t. 5, f. 7-8, 1908—SEEVER, Mycologia III, 58, 1911—KAUFFM. Papers Mich. Acad. Sci. I, 104, 1923—BISBY, BULLER & DEARN. Fung. Manitoba, 58, 1929—MAINS, Papers Mich. Acad. Sci. XX, 82, 1935—POVAH, Papers Mich. Acad. Sci. XX, 132, 1935.

*Microglossum vitellinum* (non SCHROET.) UNDERW. Minn. Bot. Stud. I, 496, 1896.

*Microglossum vitellinum* var. *irregularare* UNDERW. Ibid. I, 496, 1896.

*Ascocorynium irregularare* S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 147, 1932—IMAI, Trans. Sapporo Nat. Hist. Soc. XIII, 179, t. 7, f. 1-2, 1934—KOBAYASI, Nippon Inkwas. Duk. 317, t. 149, f. 1-2, 1939.

Nom. jap. *Kwaben-take-modoki*.

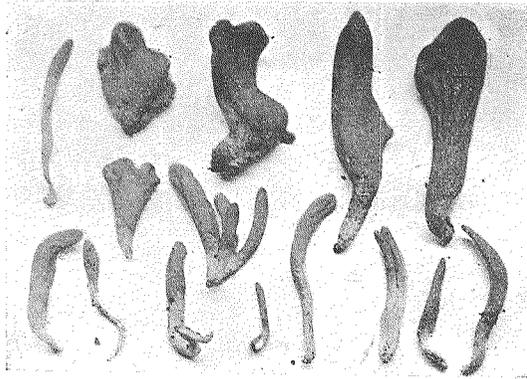


Fig. 1.

*Ascocorynium irregularare* (Specimina in Prov. Kōzuke).

Ascomatibus gregariis, subcaespitosis raro solitariis, clavatis, lanceolatis vel monstrosis, raro subglobosis sessilibusque, teretis, raro plus minusve compressis, saepe ruguloso-plicatulis, contortis, apicibus attenuatis vel obtusis, raro lobatis, carnosis, 1-7 cm. longis; clavulis flavo-vitellinis,  $\frac{1}{2}$ - $\frac{1}{3}$  ascomatae loculis, usque ad 2 cm. crassis; stipitibus deorsum attenuatis, albis, pruinosis, fibrillosis vel leviter tomentosis, usque ad 3 cm. longis et 1 cm. crassis, raro nullis; carne flavo-alba; ascis clavato-cylindraceutis vel cylindraceuto-subclavatis, apice rotundatis, poro iodo non vel vix caerulescentibus, (70-)90-150 × 5-10 μ, octosporis; sporis monostichis vel supra bistichis, late-ellipsoideis vel brevi fusiformibus, raro leviter reniformibus, continuis, hyalinis, levibus,

6-10 × (2.5-)4-5 μ (majoribus 8 × 5); paraphysibus nullis.

Hab. ad terram in silvis, vulgo in silvis coniferis montis, in regione septentrionale, autumno.

Typus in Herb. New York State Mus., Albany, N. Y., Amer. bor.

Loc. typ.: Sandlake, New York, Amer. bor.

Area distr.: America bor., Asia orient. (Japonia).

Exempl. invest.:

Karafuto—Monte Kashipo (Oct. 1934).

Hokkaidô—Kitami: Oketo (S. IMAI, Sept. 26, 1934); Rubeshibe (S. IMAI, Sept. 28, 1934). Kushiro: Akan (S. IMAI, Sept. 21, 23, 1934). Tokachi: Monte Nupkaushinupri (S. IMAI, Sept. 29, 1929). Ishikari: Monte Taisetsu, Sôunkyô (S. IMAI, Sept. 5, 1934); Aizankei (S. IMAI, Oct. 4, 1938). Iburi: Shikotsu (S. IMAI, Sept. 15, 1934).

Honshû—Kôzuke: Katashina-mura, Sugenuma (S. IMAI, Oct. 5, 1937). Shimotsuke: Oku-nikkô (S. IMAI, Oct. 23, 1936; Oct. 9, 1937).

*Ascocorynium irregulare* is a very striking fungus because of the light orange-yellow colored clavate ascophores, in regard to which it resembles a yellow *Clavaria*.

As has been mentioned by DURAND, the fungus is extremely variable and polymorphic in shape. At Mt. Nupkaushinupri, the writer collected a large number of specimens which varied from the typical clavate form to abnormal *Spragueola* form.

*Spragueola americana* was established by MASSEE basing on a material which was collected by SPRAGUE in Massachusetts and formerly reported by BERKELEY as *Mitrula crispata* FR.

The fungus is subglobose, attached by a broad base to the ground and covered by a coarsely nodulose hymenium over the whole aerial surface, of which, however, the characters of the asci and spores quite resemble those of *Mitrula irregularis*. After the examination of the type specimen, DURAND united the two as a single and the same species.

The distinction between *A. irregulare* and *A. vitellinum* has been mentioned by DURAND. As far as the Japanese material is concerned, the former species is more clustered, larger and stouter, and more irregular in shape. Moreover the color of hymenium is, when young, empire-yellow, buff-yellow or apricot-yellow, then becoming gradually darker to light cadmium or light orange-yellow, and finally deep chrome. But the color of the latter species is at first deep chrome, then becoming darker from capucine-yellow to cadmium-yellow, finally to orange, consequently the

latter is darker in orange hue.

The measurements of the asci and spores for this fungus given by different authors are as follows:

For *Mitrula irregularis*:

PECK (1896) spores 0.0003–0.0004 in. long.  
 SACCARDO (1889) spores  $10 \times 5 \mu$ .  
 DURAND (1908) asci  $90-150 \times 5-6 \mu$ ; spores  $6-10 \times 4-5 \mu$  ( $8 \times 5$ ).

For *Mitrula luteola*:

ELLIS (1883) asci  $90-100 \times 5-6 \mu$ ; spores  $6-7 \times 2.5-3.2 \mu$ .  
 MASSEE (1897) asci  $100 \times 6 \mu$ ; spores  $6-7 \times 3 \mu$ .

For *Spragueola americana*:

MASSEE (1897) asci  $70-80 \times 5-6 \mu$ ; spores  $6.5-7 \times 3.5 \mu$ .

DURAND ascertained, after the examination of the type specimens, that *Mitrula luteola* ELLIS is nothing other than the same species as *M. irregularis*. The writer has also ascertained it on the specimens of *Mitrula luteola* in ELLIS North American Fungi.

### *Ascocorynium vitellinum* (BRES.) S. ITO et IMAI

*Geoglossum vitellinum* BRES. Rev. Myc. IV, 212, 1882; Fung. Trid. I, 41, t. 45, f. 1, 1883—QUÉL. Ench. Fung. 265, 1886.

*Microglossum vitellinum* BOUD. Bull. Soc. Myc. Fr. I, 110, 1885; Hist. Class. Disc. Eur. 87, 1907—SCHROET. in ENGLER & PR. Nat. Pfl. Fam. I, 1, 164, 1894—YASUDA, Bot. Mag. Tokyo, XXXI, (121), 1917.

*Mitrula vitellina* SACC. Atti R. Istit. Ven. ser. 6, III, 725, 1885; Syll. Fung. VIII, 36, 1889—REHM, Pilze Deut., Hyst. & Disc. 1150, cum fig., 1896—MASS. Ann. Bot. XI, 273, t. 12, f. 3-4, 1897—DURAND, Ann. Myc. VI, 399, t. 5, f. 5-6, 1908—BRES. Icon. Myc. XXIV, t. 1185, f. 1, 1932.

*Ascocorynium vitellinum* S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 147, 1932—IMAI, Trans. Sapporo Nat. Hist. Soc. XIII, 179, 1934.

Nom. jap. *Hime-kammuritake*.

Ascomatibus vulgo gregariis, raro caespitosis, lanceolatis, clavatis, vel subcylindratis, raro plus minusve compressis, raro longitudinaliter rugosis plicatisve, carnosis, 1–5 cm. longis; clavulis flavo-vitellinis vel aurantiaceis, a stipite delimitatis, vulgo  $\frac{1}{2}$  raro  $\frac{1}{3}$  ascomatae locuris, 2–6 mm. crassis; stipitibus cylindratis, aequalibus vel deorsum leviter attenuatis, raro compressis, plus minusve flexuosis, albidis, floccoso-squamulosis vel fibrillosis,

usque ad 3 cm. longis et 5 mm. crassis; carne flavo-alba; ascis cylindraco-subclavatis vel clavato-cylindracois, apicibus rotundatis, poro iodo non vel vix caerulescentibus, (70-)75-90 × 5-6(-8)  $\mu$ , octosporis; sporis monostichis, late ellipsoideis, breve fusiformibus vel raro leniter reniformibus, continuis, hyalinis, levibus, 4-7.5(-8) × 3-4  $\mu$  (majoribus 5 × 3); paraphysibus nullis.

Hab. ad terram in silvis coniferis vel mixtis, vel ad truncos putridos, autumnno.

Typus in Herb. BRESADOLA.

Loc. typ.: Tirol, Italia bor.

Area distr.: Europa austr., America bor., Asia orient. (Japonia).

Exempl. invest.:

Honshû—Yamashiro: Kyôto (T. HEMMI, Oct. 18, 1933, in Herb. HEMMI, Univ. Imp. Kyoto); Iwakurayama (T. HEMMI & al., Oct. 12, 29, 1929, Oct. 21, 1934, in Herb. HEMMI). Kii: Tanabe, Isoma (K. MINAKATA, Nov. 26, 1906). Harima: Ono-machi (K. MATSUSHIMA, Nov. 8, 12, 1916, in Herb. YASUDA, in Herb. Tokyo Sci. Mus.); Kashima-mura (U. OUE, Oct. 31, 1918, in Herb. YASUDA, in Herb. Tokyo Sci. Mus.). Inaba: Tottori, Ochidani (I. MATSUURA, Nov. 7, 1930); Ubeno-mura (Y. HASHIOKA, Nov. 3, 1930, in Herb. HEMMI, Univ. Imp. Kyoto).

Kyûshû—Hizen. Monte Unzen (S. IMAI, Oct. 22, 1939).

As mentioned in the preceding pages the present fungus is more regularly clavate, smaller and more slender in shape than *A. irregulare*, and also the color is darker in orange hue. The distribution of this fungus is in the southern habitat, different to that of *A. irregulare* which distributes in the northern district.

The measurements of the asci and spores of this fungus given by several authors are as follows:

BRESADOLA (1882, 1932)	asci 70-85 × 6-8 $\mu$ ; spores 7-8 × 4 $\mu$ .
REHM (1896)	asci 70-85 × 6-8 $\mu$ ; spores 7-8 × 4 $\mu$ .
MASSEE (1897)	asci 75-80 × 7-8 $\mu$ ; spores 7-8 × 4 $\mu$ .
DURAND (1908)	asci 75-80 × 5-6 $\mu$ ; spores 4-6 × 3-4 $\mu$ .

### *Mitrula* FR. emend. IMAI (sensu strict.)

*Leotia* PERS. Syn. Fung. 611, 1801, pro min. parte; Myc. Eur. I, 198, 1822, pro min. parte.

*Mitrula* FR. Syst. Myc. I, 491, 1821, pro parte; Syst. Orb. Veg. I, 89, 1825; Epicr. Myc. 583, 1838, pro parte; Summa Veg. Scand. 347, 1849, pro parte—BERK. in SMITH Engl. Fl. V, 2, 183, 1836; Outl. Brit. Fung. 360, 1860, pro parte—RABENH. Deut. Krypt. Fl. I, 329, 1844—

KICKX, Fl. Crypt. Flandr. I, 501, 1867—CKE. Handb. Brit. Fung. 660, 1871, pro parte; Mycogr. I, 99, 1876, pro parte—KARST. Myc. Fenn. I, 6, 1871, pro min. parte—QUÉL. Champ. Jura Vosg. II, in Mém. Soc. D'Emul. Montb. 2 sér. V, 385, 1873, pro parte; Ench. Fung. 269, 1886, pro min. parte—GILL. Disc. Fr. 27, 1879, pro parte—BOUD. Bull. Soc. Myc. Fr. I, 110, 1885; Hist. Class. Disc. Eur. 88, 1907, pro parte—PHILLIPS, Brit. Disc. 26, 1887, pro parte—SACC. Syll. Fung. VIII, 32, 1889, pro min. parte—SCHROET. Pilze Schles. II, 17, 1893, pro parte; in ENGLER & PR. Nat. Pfl. Fam. I, 1, 163, 1894, pro parte—MASS. Brit. Fung. Fl. IV, 480, 1895, pro parte; Ann. Bot. XI, 264, 1897, pro min. parte—REHM, Pilze Deut., Hyst. & Disc. 1146, 1896, pro parte—DURAND, Ann. Myc. VI, 397, 1908, pro min. parte—LLOYD, Geoglossaceae, 14, 1916, pro parte—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 145, 1932, pro parte.

Ascoma hemiangiocarpum, gelatinoso-carnosum, rectum, stipitatum, clavatum vel capitatum. Clavula obovato-ellipsoidea, ellipsoidea vel piriformi, in apice stipitis discreta, laete colorata (vulgo flava vel aurantia). Asci cylindraceo-clavati, inoperculati, octospori; sporae bistichae vel oblique monostichae, cylindraceae, longe ellipsoideae, clavato-cylindraceae vel angusto-fusiformes, hyalinae, continuae vel raro demum 1-septatae; paraphyses praesentes, filiformes.

Typus: *Mitrula paludosa* FR.

Although PERSOON, in 1794 (sec. DURAND), established the genus *Mitrula* basing on *M. Heyderia*, it was not used in any of his subsequent publications, but he included the species in the *Leotia* and treated it as a synonym of *Leotia Mitrula* [= *Mitrula cucullata* (BATSCH) FR.]. In 1803, SCHUMACHER revived the genus *Mitrula* and reported *M. Heyderia*.

In 1821, FRIES described the genus *Mitrula* basing upon *M. paludosa*, and separated *M. abietis* and *M. pusilla* from the genus *Mitrula* genuina as the species of its subgenus *Heyderia*. In 1825, FRIES excluded the subgenus *Heyderia* from *Mitrula* in considering the species of the subgenus *Heyderia* as species of *Geoglossum*.

In 1838 FRIES, however, proposed *Mitrula* in the wider sense, in which the genera *Spathularia* and *Mitrula* containing *Heyderia* were included, and he divided it into three groups. QUÉLET, in 1886, used *Mitrula* following this sense.

Subsequently many authors included *M. paludosa*, *M. cucullata* and others in the genus *Mitrula* following the first sense of FRIES.

Among them KARSTEN and MASSEE, however, included in the genus *Mitrula* many clavate fungi with hyaline, elongated spores. In 1885, BOUDIER established the genus *Heyderia* including *Mitrula cucullata* and *M. sclerotipes* BOUD., separating them from *Mitrula* genuina.

According to the studies of G. DITTRICH<sup>1)</sup> and E. J. H. CORNER<sup>2)</sup>, *Mitruia paludosa* FR. is hemiangiocarpic, while *M. pusilla* FR., which has been by some considered the same species as *M. cucullata*, is gymnocarpic, consequently the two are clearly distinct in the developmental phase. Moreover, they are also distinct in the macroscopic features.

FRIES had separated the two into two subgenera, the writer, however, considers them to be separated as two distinct genera, and retains the name *Mitruia* for the *M. paludosa* group.

The genus name *Heyderia* was unfortunately preoccupied by C. KOCH for a species of Conifer in 1873, thus the writer gives a new genus name *Gymnomitruia* for the *Heyderia* group of FRIES.

### *Mitruia paludosa* FR.

?*Helvella loricata* VILL. Fl. Dauph. III, 1045, t. 56, 1789.

*Clavaria phalloides* BULL. Champ. Fr. 214, t. 463, f. 3, 1791.

?*Clavaria epiphylla* DICKS. Pl. Crypt. III, 22, t. 9, f. 10, 1793—SOW. Engl. Fung. t. 293, 1803.

?*Leotia Ludwigii* PERS. Syn. Fung. 611, 1801.

?*Leotia Dicksoni* PERS. Ibid. 612, 1801.

*Leotia Bulliardii* PERS. Ibid. 612, 1801.

*Leotia loricata* PERS. Ibid. 614, 1801.

*Helvella aurantiaca* CUMINO, Act. Acad. Sci. Tour. 1805, 221.

*Mitruia paludosa* FR. Syst. Myc. I, 491, 1821; Epicr. Myc. 584, 1838—BERK. in SMITH Engl. Fl. V, 2, 180, 1836; Outl. Brit. Fung. 360, 1860—RABENH. Deut. Krypt. Fl. I, 330, 1844—KICKX, Fl. Krypt. Flandr. I, 501, 1867—FUCK. Symb. Myc. 332, 1869—CKE. Handb. Brit. Fung. II, 660, 1871; Mycogr. I, 101, t. 45, f. 175, 1876—KARST. Myc. Fenn. I, 28, 1871—QUÉL. Champ. Jura Vosg. II, in Mém. Soc. D'Emul. Montb. 2 sér. V, 385, 1873; Ench. Fung. 269, 1886—GILL. Disc. Fr. 27, 1879—PHILLIPS, Brit. Disc. 28, 1887—ROLLAND, Atlas Champ. 105, t. 119, f. 278, 1910—LIND, Dan. Fung. 87, 1913—LLOYD, Geoglossaceae, 14, f. 796, 1916—LUIJK, Kruidk. Arch. Jaarg. 1918, 118, f. 1, 1919; Meded. Rijks Herb. Leiden No. 39, 1, f. 1, 1919—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 147, 1932—IMAI, Ann. Myc. XXXVIII, 269, f. 1, 1940.

*Leotia uliginosa* PERS. Myc. Eur. I, 200, 1822—GREV. Scot. Crypt. Fl. t. 312, 1828.

*Leotia uliginosa* α *Bulliardii* PERS. Ibid. 200, 1822.

1) DITTRICH, G.: Zur Entwicklungsgeschichte der Helvellineen. In COHN's Beiträge zur Biologie der Pflanzen, VIII, 17-25, taf. 4-5, 1898.

2) CORNER, E. J. H.: Studies in the Morphology of Discomycetes. III. The Clavuleae. In Trans. Brit. Myc. Soc. XV, 107-120, 3 figs., 1930.

?*Leotia uliginosa*  $\beta$  *Ludwigii* PERS. Ibid. 200, 1822.

*Leotia uliginosa* var. *aurantiaca* PERS. Ibid. 201, 1822.

*Mitrula phalloides* CHEV. Fl. Paris. 114, 1827—SACC. Syll. Fung. VIII, 33, 1889—SCHROET. Pilze Schles. II, 17, 1893; in ENGLER & PR. Nat. Pf. Fam. I, 1, 163, 1894—MASS. Brit. Fung. Fl. IV, 481, cum fig. 1895—REHM, Pilze Deut., Hyst. & Disc. 1147, cum fig. 1896—UNDERW. Minn. Bot. Stud. I, 497, 1896—YASUDA in MATSUM. & MIYOS. Crypt. Jap. Icon. III, I, t. 18, 1900; Bot. Mag. Tokyo, XXVIII, (235), 1914—DURAND, Ann. Myc. VI, 400, t. 17, f. 185, 1908—WILSON & SEAVER, Mycologia, I, 123, 1909—KILLERM. Krypt. Forsch. No. 3, 148, 1918—KAWAMURA, Jap. Fung. no. 7, 1929—BRES. Icon. Myc. XXIV, t. 1184, f. i, 1932—POVAH, Papers Mich. Acad. Sci. XX, 132, 1935—KOBAYASI, Nippon Inkwas. Dukan, 313, t. 147, f. 1-2, 1939.

*Leotia elegans* BERK. London Journ. Bot. V, 6, 1846 (teste DURAND).

*Mitrula elegans* FR. Nov. Symb. Myc. 103, 1851 (teste DURAND)—BERK. Grevillea III, 149, 1875; Hedwigia XIV, 9, 1875—CKE. Mycogr. I, 104, t. 46, f. 182, 1875—SACC. Syll. Fung. VIII, 37, 1889—MASS. Ann. Bot. XI, 274, 1897.

*Mitrula paludosa* var. *pachycephs* KARST. Revis. Mon. Ascom. Finl. 110, 1885.

*Mitrula phalloides* var. *pachycephs* SACC. Syll. Fung. VIII, 33, 1889.

*Microglossum elegans* UNDERW. Minn. Bot. Stud. I, 495, 1896.

*Mitrula laricina* MASS. Ann. Bot. XI, 271, t. 13, f. 69, 1897—BURT, Rhodora, I, 65, 1899.

*Mitrula norvegica* E. ROSTR. Chria. Vidensk. Selskabs Skrifter 1904, 5 (teste IMAI)—SACC. Syll. Fung. XVIII, 6, 1906.

*Mitrula phalloides* var. *aurantiaca* BOUD. Icon. Myc. III, t. 427<sup>bis</sup>, 1909—SACC. Syll. Fung. XXII, 602, 1913.

Nom. jap. *Kammuri-take*.

Ascomatibus gregariis vel solitariis, raro subcaespitosis, mollis, tremellosis, ovato-capitatis vel clavatis, 2-6 cm. vel ultra longis; clavulis subglobois, obovatis, ellipsoideis, ellipsoideo-obovatis vel piriformibus, subcompressis, clare delimitatis, laete flavo-vitellinis, glabris, levibus vel plus minusve longitudinaliter plicatulis, apice rotundatis, attenuatis, subtruncatis vel raro subbifidis, 0.5-2 cm. longis, 0.3-1 cm. crassis, intus solidis vel farctis, dein cavis et aqua saepius repletis; stipitibus cylindraccis, saepe subflexuosis, albidis, flavidulis vel dilutissime incarnatis, levibus, udo viscidis translutescentibusque, 1.5-4 cm. longis, 1.5-3 mm. crassis; ascis cylindraccis-clavatis vel subclavatis, apice contractis, acutis, poro iodo non vel vix caerulescentibus, longe stipitatis, (60-)90-140(-150)  $\times$  (6-)7.5-10  $\mu$ , octosporis; sporis bistichis vel oblique monostichis, cylindraccis, clavato-cylindraccis vel subfusiformibus, continuis, demum raro 1-septatis, rectis vel curvatis, hyalinis, levibus, 10-18  $\times$  2-4  $\mu$ ; paraphysibus filiformibus, ramosis, septatis, apicibus vix incrassatis, hyalinis.

Hab. ad folia putrida plerumque in paludosis vel saepe ad folia acuae, vere—aestate.

Typus in ? Herb. E. FRIES.

Loc. typ.: ignotum.

Area distr.: Europa, America bor., Asia orient. (Japonia).

Exempl. invest.:

Honshû—Rikuchû: Morioka, Takizawa-mura (G. YAMADA, Mai. 27, 1917). Rikuzen: Sendai (A. YASUDA, Apr. 18, 1920, in Herb. YASUDA, in Herb. Tokyo Sci. Mus.). Tamba: Nishi-Homme-mura (S. AKAI, Mai. 21, 1932, in Herb. HEMMI, Univ. Imp. Kyôto).

The present species is well distinguished by the tremellose texture, and the vitelline yellow head, white and smooth stipe, as well as by the small subcylindrical spores.

The measurements of the asci and spores which were given by different authors are as follows:

For *Mitrula paludosa*:

FUCKEL (1868)		spores $13 \times 4 \mu$ .
COOKE (1876)		spores $12-14 \times 3.5 \mu$ .
KARSTEN (1871)	asci $120-130 \times 8-9 \mu$ ;	spores $12-21 \times 3-3.5 \mu$ .
QUÉLET (1873)		spores $16 \mu$ long.
PHILLIPS (1887)		spores $12-14 \times 3.5 \mu$ .
LLOYD (1916)		spores $16 \times 2.5 \mu$ .

For *Mitrula phalloides*:

SACCARDO (1889)		spores $12-14 \times 3.5-4 \mu$ .
SCHROETER (1893)	asci $120-130 \times 8-9 \mu$ ;	spores $12-20 \times 3-4 \mu$ .
MASSEE (1895)		spores $12-15 \times 3.5-4 \mu$ .
REHM (1896)	asci $90-120 \times 8-9 \mu$ ;	spores $12-18 \times 3-4 \mu$ .
YASUDA (1900)	asci $120-130 \times 8 \mu$ ;	spores $12-20 \times 3 \mu$ .
DURAND (1908)	asci $60-150 \times 6-7 \mu$ ;	spores $10-18 \times 2.5-3 \mu$ .
BRESADOLA (1932)	asci $120-130 \times 8 \mu$ ;	spores $14-18 \times 3-4 \mu$ .
KOBAYASI (1939)	asci $80-110 \times 5-6 \mu$ ;	spores $12-14 \times 2-2.5 \mu$ .

For *Mitrula laricina*:

MASSEE (1897)	asci $100-130 \times 8-9 \mu$ ;	spores $12-18 \times 3.5-4 \mu$ .
---------------	---------------------------------	-----------------------------------

For *Mitrula elegans*:

COOKE (1876)		spores $12 \mu$ long.
MASSEE (1897)	asci $100 \times 8-9 \mu$ ;	spores $12-14 \times 3 \mu$ .

For *Mitrula nervegica*:

ROSTRUP (1904)	asci $65 \times 5 \mu$ ;	spores $15-16 \times 3-4 \mu$ .
----------------	--------------------------	---------------------------------

IMAI (1940) asci 65-100 × 5-7.5 μ; spores 12.5-17.5 × 3-4 μ.

MASSEE treated *Mitrula elegans* as a valid species with a long, slender stipe. DURAND, however, after the examination of the type specimen, ascertained that the fungus is nothing more nor less than a very slender condition of *M. paludosa* FR. with which its close relationship had long ago been detected by FRIES. It is probably material which was growing deep down in long mosses.

As mentioned in the writer's previous paper, *Mitrula norvegica* ROSTR., as far as the specimens in the Oslo Botanical Museum are concerned, is undoubtedly the same species as *M. paludosa*. Dried material of this fungus may have been often misidentified with *Mitrula pistillaris* BERK. in Europe.

### ***Gymnomitrula* IMAI, nom. nov.**

*Mitrula* PERS. in ROEMER N. Mag. Bot. J, 116, 1794 (sec. DURAND).

*Leotia* PERS. Syn. Fung. 611, 1801, pro min. parte.

*Mitrula* B. *Heyderia* FR. Syst. Myc. I, 492, 1821; Epicr. Myc. 584, 1838; Summa Veg. Scand. 347, 1849.

*Heyderia* (non C. KOCH, 1873) BOUD. Bull. Soc. Myc. Fr. I, 110, 1885.

*Mitrula* Auct. pro parte.

Ascoma gymnocarpum, ceraceo-carnosum vel carnosum, rectum, stipitatum, capitatum; clavula ovata, globosa, obovata, apicem stipitis ambiente, plerumque laete colorata. Asci cylindraceo-clavati, octospori, inoperculati; sporae oblique monostichae vel subdistichae, angusto-fusiformes, continuae, demum raro 1-septatae, hyalinae, leves; paraphyses praesentes, filiformes.

Typus: *Mitrula abietis* FR.

Etym.: Gymnos + *Mitrula*.

According to CORNER's investigation on *Mitrula pusilla*, the fungus is gymnocarpic, from which *M. paludosa* is clearly distinct in the developmental phase. Although the observation on this phase of *M. abietis* has not yet been made, the same structure is also surmised on it from its macroscopic features, as well as from its microscopic ones. Moreover, *Mitrula pusilla* has been considered by some to be the same in species with *M. abietis*, but only a small form growing on pine needles.

### **Clavis specierum.**

1. Ascoma ad folia delapsa acuae parasitum; sporae 12-16(-18) × 2-3 μ ..... *G. abietis*.
2. Ascoma ad muscos parasitum; clavula flavo-ochracea, levis vel rugulosa ..... *G. gracilis*.

***Gymnomitrula abietis* (FR.) IMAI, comb. nov.**

*Evela cucullata* BATSCH, Elench. Fung. Cont. I, 189, f. 132, 1786 (teste FR.).

*Mitrula Heyderia* PERS. in ROEMER N. Mag. Bot. I, 116, 1794 (sec. DURAND); Tent. Disp. Fung. 36, t. 4, f. 12, 1797 (teste FR.)—SCHUM. Enum. Sael. II, 409, 1803.

*Clavaria ferruginea* SOW. Engl. Fung. t. 84, 1797.

*Leotia Mitrula* PERS. Syn. Fung. 611, 1801; Myc. Eur. I, 199, 1822—GREV. Scot. Crypt. Fl. t. 81, 1823.

*Mitrula (Heyderia) abietis* FR. Syst. Myc. I, 492, 1821—LIND, Dan. Fung. 87, 1913—IMAI, Ann. Myc. XXXVIII, 270, 1940.

*Verpa ferruginea* WALLR. Fl. Germ. II, 549, 1833.

*Geoglossum cucullatum* FR. Elench. Fung. I, 233, 1838.

*Mitrula cucullata* FR. Epicr. Myc. 584, 1838—RABENH. Deut. Krypt. Fl. I, 330, 1844—BERK. Outl. Brit. Fung. 360, 1860—FUCK. Symb. Myc. 332, 1869—CKE. Handb. Brit. Fung. 660, 1871; Mycogr. I, 101, t. 45, f. 176, 1876—KARST. Myc. Fenn. I, 28, 1871—QUÉL. Champ. Jura Vosg. II, in Mém. Soc. D'Emul. Montb. 2 sér. V, 385, 1873; Ench. Fung. 269, 1886—GILL. Disc. Fr. 27, 1879—PHILLIPS, Brit. Disc. 27, 1887—SACC. Syll. Fung. VIII, 33, 1889—SCHROET. Pilze Schles. II, 17, 1893; in ENGLER & PR. Nat. Pfl. Fam. I, 1, 164, 1894—MASS. Brit. Fung. Fl. IV, 482, 1895; Ann. Bot. XI, 276, t. 12, f. 39-41, 1897—REHM, Pilze Deut., Hyst. & Disc. 1148, 1896—UNDERW. Minn. Bot. Stud. I, 497, 1896—DURAND, Ann. Myc. VI, 402, t. 5, f. 1, 1908—BATAILLE, Bull. Soc. Myc. Fr. XXVII, 383, 1911—LLOYD, Geoglossaceae, 15, f. 797, 1916—KILLERM. Krypt. Forsch. No. 3, 148, 1918—LUIJK, Kruidk. Arch. Jaarg. 1918, 120, f. 2, 1919; Meded. Rijks Herb. Leiden No. 39, 1, 1919—KAUFFM. Papers Mich. Acad. Sci. I, 104, 1923—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 147, 1932.

*Mitrula cucullata* a. *Abietis* FR. Ibid. 584, 1838.

*Heyderia cucullata* BOUD. Bull. Soc. Myc. Fr. I, 110, 1885.

Nom. jap. *Matsuba-hime-kammuri-take*.

Ascomatibus gregariis vel solitariis, pusillis, tenuissimis, subcapitatis, 1-2.5 cm. altis; clavulis ellipsoideis, ovatis vel obovatis, apice obtusis, rotundatis, a stipite distinctis et subtus emarginato-liberis, vix compressis, cremeis vel flavo-ochraceis, siccate ferruginescentibus, 1-3 mm. longis, 0.5-2 mm. crassis; stipitibus cylindraceutis, tenacellis, flexuosis, aequalibus vel sursum leviter attenuatis, sursum flavo-brunneolis, deorsum sordioribus, siccate subnigrescentibus vel fusco-nigrescentibus, asperulis vel pruinosis, basi flavo-fusco-lanuginosis, 1-2 cm. longis, 0.5-0.75 mm. crassis; ascis elongato-clavatis vel cylindraceuto-clavatis, apice contractis, poro iodo caerulescentibus, 45-70 x 5-7.5  $\mu$ , octosporis; sporis oblique monostichis vel distichis, anguste fusiformibus, utrinque subattenuatis, continuis, demum raro unisep-

tatis, hyalinis, levibus, rectis vel curvatis, 12-16(-18) × 2-3 μ; paraphysibus robustulis vel subgracilibus, sursum gradatim incrassatis, brunneolis, septatis.

Hab. ad folia delapsa acuae in vallibus udis. aestate—autumno.

Typus in ? Herb. E. FRIES.

Loc. typ.: ignotum.

Area distr.: Europa, America bor., Asia orient. (Japonia), Australia.

Exempl. invest.:

Hokkaido—Ishikari: Monte Soranuma (S. IMAI, Sept. 19, 1930); Monte Kurodake (S. IMAI, Aug. 18, 1933).

The present fungus is well characterized by its color, small size, slender habit and habitat on fallen coniferous leaves.

In his Systema Mycologium, FRIES had reported the fungus under the name *Mitrula abietis* including *Elv. cucullata* BATSCH as its synonym. According to the International Rules of Botanical Nomenclature, the former is the valid one for this fungus.

As for the problem whether *Mitrula pusilla* is a distinct species or a small form growing on pine needles of *M. abietis*, there is somewhat of a question. The writer has collected no material which is identical with *M. pusilla* in our country, so he can not actually comment on this question.

As has been mentioned by DURAND, this minute fungus is probably much more widely distributed in the coniferous woods in the boreal region of the northern hemisphere than has been recorded, but it is easily overlooked owing to its small size.

The measurements of the asci and spores of this fungus given by many authors are as follows:

FUCKEL (1869)	asci 66 × 6 μ;	spores 14 × 3 μ.
COOKE (1876)		spores 12 × 3 μ.
KARSTEN (1871)	asci 65-70 × 6 μ;	spores 13-15 × 2.5-3 μ.
QUÉLET (1873)		spores 15 μ long.
PHILLIPS (1887)		spores 12 × 3 μ.
SACCARDO (1889)		spores 12-14 × 3.5-4 μ.
SCHROETER (1893)	asci 55-70 × 5-6 μ;	spores 14-18 × 2-3 μ.
MASSEE (1895)		spores 10-12 × 3 μ.
MASSEE (1897)	asci 60-70 × 6 μ;	spores 12-18 × 3 μ.
REHM (1897)	asci 50-70 × 6-7 μ;	spores 14-17 × 2-3 μ.
DURAND (1908)	asci 45-70 × 6 μ;	spores 13-16 × 2-3 μ.
BATAILLE (1911)	asci 75 × 5-6 μ;	spores 14-16 × 3 μ.

***Gymnomitrula gracilis* (KARST.) IMAI, comb. nov.**

*Mitrula gracilis* KARST. Hedwigia, XXII, 17, 1883; Rev. Mon. 110, 1885—SACC. Syll. Fung. VIII, 34, 1889—MASS. Ann. Bot. XI, 278, 1897—DURAND, Ann. Myc. VI, 403, t. 5, f. 3-4, 1908—SEEVER, Mycologia, III, 57, 1911—LLOYD, Geoglossaceae, 15, 1916—LARSEN, Bot. Iceland, II, 507, 1932—MAINS, Amer. Journ. Bot. XXVII, 325, f. 9, 1940—IMAI, Ann. Myc. XXXVIII, 270, 1940.

*Mitrula muscicola* E. HENN. Ofvers. Af. K. Vet. Ak. Forh. 1885, 71, t. 8, f. 6-8, 1885—SACC. Syll. Fung. VIII, 34, 1889—MASS. Ann. Bot. XI, 279, t. 13, f. 73, 1897—DURAND, Ann. Myc. VI, 404, t. 5, f. 2, 1908; Mycologia, XIII, 185, 1921—KAUFFM. Papers Mich. Acad. Sci. I, 104, 1923.

*Mitrula gracilis* var. *flavipes* PECK, 49 Ann. Rep. N. Y. State Mus. 32, 1896—SACC. Syll. Fung. XIV, 741, 1899.

Nom. jap. *Koke-hime-kammuri-take*.

Ascomatibus solitariis, gracilibus, capitatis, 1-2.5 cm. longis; clavulis obovato-globosis vel oblongatis, obtusis, subtus emarginato-liberis, flavis vel flavo-ochraceis, siccate aurantio-brunneis, 1-5 mm. longis, 1-4 mm. crassis, glabris, sublevibus, rugosis vel lacunoso-rugosis; stipitibus filiformibus tenuisque, circa 1 mm. crassis, aequalibus, flexuosis, levibus, cremeo-albidis vel flavidulis, siccate brunnescentibus, subtranslutescentibus, 0.2-2 cm. longis; ascis clavatis vel sublanceolatis, apice rotundatis, poro iodo caerulescentibus, 60-100 × (5-)6-7.5(-9) μ, octosporis; sporis distichis, oblongo-fusiformibus vel fusiformibus, hyalinis, levibus, continuis vel demum uniseptatis, (8-)8.75-12-16 × (2-)2.5-3 μ, rectis vel leviter curvatis; paraphysibus filiformibus, apice non vel vix incrassatis.

Hab. locis muscosis in silvis coniferis, in musco parasitica, aestate—autumno.

Typus in Herb. KARSTEN, Mus. Bot., Univ. Helsingfors, Fennia.

Loc. typ.: prope Knjäscha maris albi, Fennia.

Area distr.: Europa septent., America borealis, Greenland, Iceland, Asia orient. (Japonia).

Exempl. invest.:

Honshû—Mutsu: Monte Hakkôda, Ôdake (S. IMAI, Sept. 19, 1937).

As to the identity of *Mitrula gracilis* and *M. muscicola*, the writer is inclined to support the proposal of SEEVER and MAINS who consider the two as a single species.

The measurements of the asci and spores given by different authors are as follows:

For *Mitrula gracilis*:

KARSTEN (1883)	asci 60-85 × 5-6 μ;	spores 8-12 × 2 μ.
SACCARDO (1889)	asci 60-85 × 5-6 μ;	spores 8-12 × 2 μ.
MASSEE (1897)	asci 60-85 × 5-6 μ;	spores 8-12 × 2 μ.
DURAND (1908)	asci 65-80 × 6-8 μ;	spores 10-14 × 2-3 μ.
MAINS (1940)	asci 65-90 × 6-9 μ;	spores 10-14 × 2 μ.
IMAI (1940)	asci 68-75 × 6 μ;	spores 10-16 × 2.5-5 μ.
"	asci 65-82.5 × 6-7.5 μ;	spores 8.75-15 × 2.5-3 μ.

For *Mitrula muscicola*:

HENNING (1885)	asci 5 μ thick;	spores 9-10 × 2-3 μ.
SACCARDO (1889)	asci 5 μ thick;	spores 9-10 × 2-3 μ.
MASSEE (1897)	asci 5 μ thick near the apex;	spores 9-10 × 2-3 μ.
DURAND (1908)	asci 65-75 × 6-8 μ;	spores 10-13 × 2-3 μ.

This is an alpine and boreal species, and has only once been collected in Japan as above mentioned, but it is probably more widely distributed in the northern district in Japan, as well as in the boreal region of the northern hemisphere.

***Scleromitrla* IMAI, gen. nov.**

*Mitrula* Auct. pro parte.

*Microglossum* P. HENN. pro min. parte.

Ascoma longe stipitatum, e sclerotio ortum, subcarnosum; pars asci-gens oblonga, clavata, ellipsoidea vel subglobosa, vulgo laete colorata. Asci clavati vel cylindracei, octospori, inoperculati; sporae ellipsoideae vel oblongo-ellipsoideae, hyalinae, leves; paraphyses filiformes, tenues, apicibus rectae vel leviter curvatae. Sclerotia praesentis.

Typus: *Microglossum Shiraianum* P. HENN.

Etym.: Scleros + *Mitrula*.

The present genus is characterized principally by the clavate or capitate ascophores springing from a sclerotium, as well as by the ellipsoidal, hyaline spores. By the presence of sclerotia it is easily distinguished from *Mitrula*, *Microglossum* and *Gymnomitrula*.

The type species, *Microglossum Shiraianum* P. HENN. is a parasite on the fruits of mulberry trees, in which it produces the sclerotium and the conidial spores. The conidial spores are subovate or subellipsoidal, hyaline and smooth. The conidiophores are long filiform, hyaline and about 3 μ in thickness, and produce conidial spores acrogenously. The presence of

the conidial spores should also be claimed as an essential criterion of the genus, they, however, have not yet been observed on the other members of this genus, *Scleromitrlula sclerotiorum* (ROSTR.) IMAI, comb. nov. and *S. sclerotipes* (BOUD.) IMAI, c. n.

***Scleromitrlula Shiraiana*** (P. HENN.) IMAI, comb. nov.

*Microglossum Shiraianum* P. HENN. in ENGLERS Bot. Jahrb. XXXII, 44, 1902—SACC. Syll. Fung. XVIII, 6, 1906—HARA, Path. Agr. Pl. 127, cum fig. 1925; Ibid. ed. 2, 291, cum fig. 1931—ENDO, Path. Mulberry Tree, 98, f. 37, 1927.

*Mitrlula Shiraiana* S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 147, 1932—KOBAYASHI, Nippon Inkwas. Dukan, 311, t. 146, f. 1-5, 1939.

Nom. jap. *Kitsune-no-yari*.

Ascomatibus solitariis vel subfasciculatis, e sclerotio ortis, clavatis, longe stipitatis, carnosis, 2.5-10 cm. longis; clavulis clavatis, longe ellipsoideis vel oblongo-fusiformibus, apice obtuse rotundatis vel contractis subacutisque, longitudinaliter plicatis vel gyrosis, glabris, brunneolis vel rufo-brunneolis, siccate subnigrescentibus, 4-15 mm. longis, 2-6 mm. crassis; stipitibus saepe elongatis, subgracilibus, subaequalibus vel sursum leviter attenuatis, teretibus vel leviter compressis, interdum flexuosis, sursum glabris levibusque, deorsum pruinosis vel subtomentosis, cinereo-brunneis, 2-9 cm. longis, 1.5-2 mm. crassis; ascis clavatis, apice obtusiusculis, basi attenuatis, 55-70 × 4-7  $\mu$ , poro iodo non caerulescentibus, octosporis; sporis oblique monostichis interdum subdistichis, anguste ellipsoideis vel subfusiformibus, utrinque acutis vel obtusiusculis, rectis vel subcurvatis, continuis, hyalinis, 4-8 × 2.5-4  $\mu$ ; paraphysibus filiformibus, tenuissimis, ca. 1  $\mu$  crassis, apice rectis vel curvatis. Sclerotii irregulariter tuberosis, 1-1.5 cm. crassis, atro-brunneis vel atris, duris, plicatulis. Conidiophoris longe filiformibus, plus minusve ramosis, hyalinis, ca. 3  $\mu$  crassis; conidiis acrogenis, ovatis vel late ellipsoideis, hyalinis, ca. 7 × 5  $\mu$ .

Hab. ad terram in agro „Mori“, e sclerotio orta, vere—aestate. Sclerotia in fructibus „Mori“ producta, vere—aestate.

Typus in Herb. P. HENNINGS in Mus. Bot., Dahlem, Berlin.

Loc. typ.: Komaba, Tokyo, Japonia.

Area distr.: Japonia.

Exempl. invest.:

Honshū—Musashi: Tokyo, Komaba (S. KUSANO, Mai. 3, 1925).

During spring and early summer, the present fungus parasites on the fruits of mulberry trees, and shrinks and hardens the fruits, on which a white mycelium and conidiophores are produced. In the affected fruit the black sclerotium is produced, by which the fungus overwinters, and in the next spring the ascophores spring from a sclerotium.

The fungus is widely distributed in Japan, and works much damage on the fruit, but the ascophores of the fungus are rarely ever collected.

### *Microglossum* GILL. emend.

*Geoglossum* Auct. pro parte.

*Mitrula* (non FR.) KARST. Myc. Fenn. I, 6, 1871, pro parte—SACC. Syll. Fung. VIII, 32, 1889, pro parte—MASS. Brit. Fung. Fl. IV, 480, 1895, pro parte; Ann. Bot. XI, 263, 1897, pro parte.

*Geoglossum* & *Leptoglossum* CKE. Mycogr. I, 250, 1879.

*Microglossum* GILL. Disc. Fr. 25, 1879—SCHROET. Pilze Schles. II, 18, 1893; in ENGLER & PR. Nat. Pfl. Fam. I, 1, 164, 1894, pro parte—REHM, Pilze Deut., Hyst. & Disc. 1151, 1896—DURAND, Ann. Myc. VI, 404, 1908—LUIJK, Kruidk. Arch. Jaarg. 1918, 122, 1919—IMAI, Bot. Mag. Tokyo, LII, 418, 1938.

*Helote* HAZSL. M. T. Akad. ért. A. Termés. Kor. XI, -(8), 1881 (sec. DURAND); Bot. Centralbl. X, 114, 1882; in JUST's Bot. Jahresb. X, 168, 1884—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 145, 1932.

*Corynetes* HAZSL. Ibid. (8), 1881 (sec. DURAND); Bot. Centralbl. X, 114, 1882; in JUST's Bot. Jahresb. X, 168, 1884—DURAND, Ann. Myc. VI, 412, 1908—LUIJK, Kruidk. Arch. Jaarg. 1918, 124, 1919—S. ITO & IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 146, 1932.

*Microglossum* SACC. Bot. Centralbl. XVIII, 214, 1884; Syll. Fung. VIII, 39, 1889.

*Leptoglossum* SACC. Ibid. XVIII, 214, 1884; Syll. Fung. VIII, 47, 1889—PHILLIPS, Brit. Disc. 31, 1887.

*Thuemenidium* O. K. Rev. Gen. Pl. 873, 1891.

*Xanthoglossum* O. K. Ibid. 875, 1891.

Ascoma carnosum, rectum, stipitatum, clavatum, flavum, fulvum, spadiceum, olivaceum, viride, atro-purpureum, atro-brunneum vel atrum. Asci clavato-cylindranei vel subcylindranei, inoperculati, vulgo octospori; sporae vulgo distichae, hyalinae, leves, longe fusiformes, subcylindratae vel cylindratae, di- vel multicellulatae (vulgo adultae 3 vel ultraseptatae); paraphyses praesentes, filiformes, apicibus rectae, curvatae vel circinatae.

Typus: *Geoglossum viride* PERS. ex FR.

As has been discussed in DURAND's paper and in the present writer's

previous paper, the species of the genus *Microglossum* had been somewhat confused with regard to the adoption of the real generic name.

As is seen from the enumeration of the synonyms under the genus, they were at first included in the old genus *Geoglossum*. In 1871, P. A. KARSTEN transferred *G. viride* PERS. and *G. glabrum* (non PERS. nec FR.) (= *M. atropurpureum*) to the genus *Mitrula*, which P. A. SACCARDO (in 1889) and G. MASSEE (in 1897) followed using it in a very broad sense and including most members of *Microglossum* in it,

In 1879, M. C. COOKE divided the old genus *Geoglossum* into two groups by the color of the spores and named its hyaline spore group subgenus *Leptoglossum*, and he divided again the subgenus *Leptoglossum* into two sections according to the color of ascophore, namely whether black or light. *Geoglossum viride* PERS., *G. olivaceum* PERS., *G. atropurpureum* PERS., *G. pistillaris* BERK. and *G. rufum* SCHW. were included in the section of the light colored ascophores, and *G. microsporum* CKE., *G. tremellosum* CKE. and *G. Hookeri* BERK. in the section of the black colored ones.

In the same year, C. C. GILLET established a new genus *Microglossum* in which *M. viride* and *M. olivaceum* were included. It is, therefore, almost equivalent to COOKE's light colored section.

In 1881, F. A. HAZSLINSZKY established two new genera *Helote* and *Corynetes*, and the former was established with *Geoglossum viride*, the latter with *G. microsporum* CKE. and *G. luteum* PK.

P. A. SACCARDO, in 1884, raised COOKE's subgenus *Leptoglossum* to generic rank, and later, in 1889, divided it into two sections, *Euleptoglossum* and *Xanthoglossum*, by the color of ascophore as proposed by COOKE.

OTTO KUNZE, in 1891, raised *Xanthoglossum* of SACCARDO to generic rank and replaced *Leptoglossum* of SACCARDO with it, because of the presence of the antedated genus *Leptoglossis* BTH. of Solanaceae published in 1884.

In 1893, J. SCHROETER reported *Microglossum* including *M. viride* and *M. atropurpureum*, but in the next year, 1894, he proposed it in a wider sense in which he divided the genus into two subgenera, *Geomitrula* of which the ascophore is light colored and *Eumicroglossum* which is dark colored. In the former subgenus, *M. vitellinum* (BRES.) SCHROET., *M. luteum* (MONT.) SCHROET., and *M. pistillare* (BERK.) SCHROET. were included, while *M. viride*, *M. atropurpureum*, and *M. partitum* PAT. in the latter subgenus. *Microglossum* in this sense was followed by L. M. UNDERWOOD in North America in 1896.

In 1908 DURAND considered the color of ascophore as an essential for the character of generic value, in following mainly COOKE's proposal, and he used *Microglossum* of GILLET as a valid genus for the species having light colored clavate ascophores and fusiform or subcylindrical, hyaline spores which become many septate finally, and *Corynetes* of HAZSLINSZKY for the species having dark or black colored ascophore and spores like to those of *Microglossum*.

The present writer, in 1938, followed DURAND's proposal and divided *Microglossum* into two sections, Eumicroglossum (non SCHROET.) and Ochroglossum.

More recently, however, the writer has thoroughly studied all the members of the fusiform, subcylindrical or cylindrical, hyaline spored group using actual material as well as consulting the literatures, and has come to the conclusion that the color of the ascophore can not be accepted as an essential criterion for the tribal and generic values, but only for sectional value in the genus *Microglossum*.

Looking over the spore characters of the fungi belonging to section Ochroglossum and to the genus *Corynetes*, no essential differences of generic value could be detected among them. A slight difference only is observed in their paraphyses: the paraphyses of the fungi of Ochroglossum are slightly enlarged and usually strongly curved at the apices, while those of *Corynetes* are variable in the thickness and the curvature of the apices, namely from not thickened to pyriformly thickened and from straight to circinate.

The fungi of section Eumicroglossum have paraphyses which are straight or curved and variable in the thickness of the apices, and the spores are rather distinct from those of the other two groups. Concerning the microscopic characters alone, thus, the Eumicroglossum may better be separated from them.

In the section Ochroglossum, *Microglossum longisporum* is rather far different from the other two species and may represent a different section, but it is included in Ochroglossum for the present.

*Mitrula globosa* which is said to be spadiceous in color, in the present writer's opinion, has the spores and paraphyses of *Corynetes*.

Moreover, the colors of the ascophores of the fungi of Eumicroglossum, of *Mitrula globosa* and of *Corynetes* become black or blackish when dried, and therefore indistinguishable.

## Clavis sectionum et specierum.

- I. Ascoma vulgo demum olivascens vel virescens; paraphyses apicibus rectae vel leviter flexuosae ..... Sect. *Eumicroglossum*.  
 A. Stipes squamosus ..... *M. viride*.  
 B. Stipes levis ..... *M. olivaceum*.
- II. Ascoma vulgo flavum, fulvum vel cinnamomeo-umbrinum; paraphyses apicibus valde curvatae vel circinatae ..... Sect. *Ochroglossum*.  
 A. Sporae uniformes.  
 1. Ascoma vitellinum; stipes squamosus ..... *M. rufum*.  
 2. Ascoma ochraceum vel flavo-argillaceum; stipes leviter squamulosus vel levis...  
 ..... *M. fumosum*.  
 B. Sporae bifformes; ascoma cinnamomeo-umbrinum vel atro-lateritium .....  
 ..... *M. longisporum*.
- III. Ascoma vulgo atropurpureum, atro-brunneum vel atrum; paraphyses apicibus curvatae vel circinatae ..... Sect. *Melanoglossum*.  
 A. Paraphyses hyalinae vel apicibus leviter purpurascens.  
 1. Asci et paraphyses in apicibus epithecio conspicuo vinoso-brunneo cohaerentes  
 ..... *M. atropurpureum*.  
 2. Epithecium nullum vel inconspicuum; ascoma robustum ..... *M. robustum*.  
 B. Paraphyses conspicue brunneae ..... *M. arenarium*.

Sect. ***Eumicroglossum*** (SCHROET.) UNDERW. emend. IMAI

*Microglossum* Subg. *Eumicroglossum* SCHROET. in ENGLER & PR. Nat. Pfl. Fam. I, 1, 164, 1894, pro parte.

*Microglossum* Sect. *Eumicroglossum* UNDERW. Minn. Bot. Stud. I, 484, 1896, pro parte.

*Microglossum* Sect. ***Eumicroglossum*** IMAI, Bot. Mag. Tokyo, LII, 418, 1938.

Ascoma vulgo demum olivascens vel virescens. Paraphyses apicibus rectae vel leviter flexuosae.

Typus: *Microglossum viride* (PERS. ex FR.) GILL.

***Microglossum viride*** ([SCHRAD.] PERS. ex FR.) GILL.

?*Clavaria serpentina* O. F. MUELL. Zool. Dan. Prod. 256, 1776—SCHRANCK, Baier. Fl. II, 571, 1789—GMEL. in LINN. Syst. Nat. II, 1443, 1791.

?*Clavaria mitrata* β *viride* HOLMSK. Beata Ruris Fung. Dan. I, 24, t. 9, 1790.

*Clavaria viridis* SCHRAD. apud GMEL. in LINN. Syst. Nat. II, 1443, 1791; Fl. Dan. t. 1258, f. 1, 1791.

*Geoglossum viride* PERS. in ROEMER N. Mag. Bot. I, 117, 1794 (sec. DURAND); Obs. Myc. I, 39, 1796; Comm. Fung. Clav. 40, t. 3, f. 3, 1797; Syn. Fung. 610, 1801—NEES, Syst. Pilze, 172, t. 17, f. 158, 1817.

?*Geoglossum glutinosum* (non PERS.) NEES, Syst. Pilze, 173, t. 17, f. 159, 1817.

*Geoglossum viride* FR. Syst. Myc. I, 489, 1821; Epicr. Myc. 582, 1838; Summa Veg. Scand. 347, 1849—PERS. Myc. Eur. I, 195, 1822—BERK. in SMITH Engl. Fl. V, 2, 179, 1836; Outl. Brit. Fung. 361, 1860—KROMBH. Abbild. Schwamm. VII, 24, t. 54, f. 26-27, 1841—KICKX, Fl. Crypt. Flandr. I, 501, 1867—CKE. Handb. Brit. Fung. 662, 1871; Mycogr. I, 9, t. 4, f. 14, 1875—QUÉL. Champ. Jura Vosg. II, in Mém. Soc. D'Emul. Montb. 2 sér. V, 384, 1873; Ench. Fung. 265, 1886—LLOYD, Geoglossaceae, 8, 1916.

*Leotia geoglossoides* CORDA, Icon. Fung. III, 37, t. 6, f. 94, 1839.

*Leotia viridis* FUCK. Symb. Myc. 284, 1869.

*Mitruula viridis* KARST. Myc. Fenn. I, 29, 1871—SACC. Syll. Fung. VIII, 38, 1889—MASS. Brit. Fung. Fl. IV, 482, 1895.

*Microglossum viride* GILL. Disc. Fr. 25, cum fig. 1879—SCHROET. Pilze Schles. II, 18, 1893; in ENGLER & PR. Nat. Pl. Fam. I, 1, 164, 1894—ARNOULD, Bull. Soc. Myc. Fr. IX, 112, 1893—REHM, Pilze Deut., Hyst. & Disc. 1151, cum fig. 1896—UNDERW. Minn. Bot. Stud. I, 496, 1896—BOUD. Hist. Class. Disc. Eur. 87, 1907—DURAND, Ann. Myc. VI, 411, t. 5, f. 23-26, t. 20, f. 208, 1908—BATAILLE, Bull. Soc. Myc. Fr. XXVII, 382, 1911—LIND, Dan. Fung. 89, 1913—RAMSB. Trans. Brit. Myc. Soc. IV, 370, 1914—KILLERM. Krypt. Forsch. No. 3, 149, 1918—LUIJK, Kruidk. Arch. Jaarg. 1918, 123, f. 3, 1919—CORNER, Trans. Brit. Myc. Soc. XV, 111, 1930—IMAI, Bot. Mag. Tokyo, LII, 418, 1938—WEHM. Canad. Journ. Research, XVIII, 540, 1940.

*Helote viridis* HAZSL. M. T. Akad. ért. A. Termés. Kor. XI, -(8), 1881 (sec. DURAND); in JUST's Bot. Jahresb. X, 168, 1884—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 147, 1932.

*Leptoglossum viride* PHILLIPS, Brit. Disc. 32, t. 2, f. 8, 1887.

*Microglossum lutescens* BOUD. Bull. Soc. Myc. Fr. XII, 14, t. 4, f. 1, 1896; Icon. Myc. III, t. 425, 1907; Hist. Class. Disc. Eur. 87, 1907—SACC. Syll. Fung. XIV, 742, 1899.

*Mitruula serpentina* MASS. Ann. Bot. XI, 268, t. 13, f. 68, 1897.

*Mitruula lutescens* MASS. Ibid. XI, 271, t. 13, f. 77, 1897.

*Leptoglossum alabamense* UNDERW. Bull. Torrey Bot. Club, XXIV, 82, 1897.

Nom. jap. *Matsuba-shamoidake*.

Ascomatibus caespitosis, fascicularibus, gregariis vel solitariis, subclavatis, 1.5-6 cm. vel ultra longis; clavulis 0.5-2.5 cm. longis, 3-10 mm. latis,  $\frac{1}{3}$  vel  $\frac{1}{2}$  ascomatae loculis, acute delimitatis, lanceolatis vel ellipsoideis, obtusis, raro irregularibus et apicibus sublobatis, compressis et longitudinaliter canaliculatis, primo griseo-olivaceis dein viridis; stipitibus cylindraceis vel

leviter compressis, aequalibus vel leviter deorsum attenuatis, usque ad 4 cm. longis, 2-5 mm. crassis, concoloribus vel pallidioribus, siccate nigrescentibus, distincte squamulosis, farctis; ascis clavato-cylindraceutis vel clavatis, apice obtusis vel leviter contractis, poro iodo caerulescentibus,  $94-150 \times 8-12 \mu$ , octosporis; sporis supernus distichis, infernus monostichis, cylindraceuto-oblongis, oblongo-clavatis vel longe fusiformibus, utrinque subobtusis, rectis vel curvatis, longe continuis, demum 3-4-septatis, hyalinis, levibus,  $14-22 (-37) \times 5-6 \mu$ ; paraphysibus filiformibus, ramosis, hyalinis, apicibus leviter pyriforme incrassatis et leviter viridescenscentibus.

Hab. ad terram in silvis pinguibus et udis, aestate—autumno.

Typus in Herb. PERSON in Rijks Herb., Leiden.

Loc. typ.: ignotum.

Area distr.: Europa, America bor., Asia orient. (Japonia).

Exempl. invest.:

Hokkaido—Kushiro: Akan (S. IMAI, Sept. 15, 16, 1933; Sept. 23, 1934). Ishikari: Monte Kurodake (S. IMAI, Aug. 18, 1933). Ihuri: Shikotsu (S. IMAI, Sept. 9, 1935). Oshima: Ôno-mura (S. IMAI, Sept. 21, 1935).

Honshû—Mutsu: Sukayu (S. IMAI, Sept. 23, 1935; Sept. 17, 1937); Towada-mura (S. IMAI, Sept. 25, 27, 1935).

Kyushû—Buzen: Monte Inugatake (H. YOSHII, Jul. 15, 1938).

The present fungus is easily distinguished macroscopically from *M. olivaceum* by the pea-green color and the squamose stipe, and also microscopically by the piriformly thickened paraphyses.

As has been reported previously by the writer, the present fungus is variable in color, depending upon the stage of development, changing from olive-ocher or honey-yellow, then through water-green, pea-green and pistacho-green or american green at length to dark green (dull blackish green), and in drying to blackish or black.

Judging from the diagnosis and figures, *Microglossum lutescens* BOUD. seems to be nothing more than this species in younger stage.

The cotype specimen kindly sent to the writer from the New York Botanical Garden shows very well that *Leptoglossum alabamense* UNDERW. belongs to this species.

RICK reported *Geoglossum viride* from Brazil, but the actual specimen which was sent from the Farlow Herbarium shows clearly that it is a distinct one from this species. Thus it should be named *Microglossum Ricki* IMAI, n. n.

The measurements of the asci and spores given by different authors

are as follows:

FUCKEL (1869)		spores $19 \times 6 \mu$ .
KARSTEN (1871)	asci $118-140 \times 10-11 \mu$ ;	spores $14-22 \times 5-5.5 \mu$ .
COOKE (1875)		spores $30 \times 10 \mu$ .
SACCARDO (1889)		spores $15-18 \times 4-5 \mu$ .
SCHROETER (1893)	asci $60-80 \times 8-10 \mu$ ;	spores $14-17 \times 4-5 \mu$ .
REHM (1896)	asci $80-100 \times 9-10 \mu$ ;	spores $15-18 \times 4-5 \mu$ .
DURAND (1908)	asci $110-150 \times 8-10 \mu$ ;	spores $14-22 \times 5-6 \mu$ .
BATAILLE (1911)		spores $12-18 \times 4-5 \mu$ .

For *Mitrula serpentina*:

MASSEE (1897)	asci $100-130 \times 11-12 \mu$ ;	spores $13-18 \times 5 \mu$ .
---------------	-----------------------------------	-------------------------------

For *Leptoglossum alabamense*:

UNDERWOOD (1897)		spores $18-20 \times 4 \mu$ .
------------------	--	-------------------------------

For *Microglossum lutescens*:

BOUDIER (1896)	asci $130-150 \times 15-17 \mu$ ;	spores $20-26 \times 6-7 \mu$ .
----------------	-----------------------------------	---------------------------------

### *Microglossum olivaceum* (PERS. ex FR.) GILL.

*Geoglossum olivaceum* PERS. Obs. Myc. I, 40, t. 5, f. 7, 1796; Comm. Fung. Clav. 41, 1797; Syn. Fung. 610, 1801.

*Geoglossum olivaceum* FR. Syst. Myc. I, 489, 1821; Epicr. Myc. 582, 1838—PERS. Myc. Eur. I, 196, 1822—BERK. Outl. Brit. Fung. 361, 1860—CKE. Handb. Brit. Fung. 663, 1871; Mycogr. I, 9, t. 4, f. 13 (p. p.), 1875—QUÉL. Champ. Jura Vosg. II, in Mém. Soc. D'Emul. Montb. 2 sér. V, 384, 1873; Ench. Fung. 266, 1886—LLOYD, Geoglossaceae 8, 1916.

*Geoglossum olivaceum* b. Dingy-purple BERK. Outl. Brit. Fung. 361, t. 22, f. 3, 1860.

*Geoglossum olivaceum* var. *purpureum* CKE. Handb. Brit. Fung. 663, 1871; Mycogr. I, 9, t. 4, f. 13 (p. p.), 1875.

*Microglossum olivaceum* GILL. Disc. Fr. 26, 1879—REHM, Pilze Deut., Hyst. & Disc. 1153, 1896—DURAND, Ann. Myc. VI, 409, t. 5, f. 19-22, t. 20, f. 209, 1908—KILLERM. Krypt. Forsch. No. 3, 149, 1918—LUIJK, Meded. Rijks Herb., Leiden, No. 39, 2, 1919—MANS, Papers Mich. Acad. Sci. XX, 82, 1935—IMAI, Bot. Mag. Tokyo, LII, 419, 1938.

*Leptoglossum olivaceum* PHILLIPS, Brit. Disc. 33, 1887.

*Mitrula olivacea* SACC. Syll. Fung. VIII, 38, 1889—MASS. Brit. Fung. Fl. IV, 483, 1895; Ann. Bot. XI, 270, 1897—BURT, Rhodora, I, 65, 1899.

*Microglossum contortum* PECK, Bull. Torrey Bot. Club, XXV, 328, 1898 (teste DURAND)—SACC. Syll. Fung. XVI, 698, 1902.

*Microglossum obscurum* PECK, Ibid. XXVI, 71, 1899 (teste DURAND)—SACC. Syll. Fung. XVI, 698, 1902.

*Helote olivacea* S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 147, 1932.

Nom. jap. *Tokiva-shamojitake*.

Ascomatibus fascicularibus, gregariis vel solitariis, clavatis, 1-5(-8) cm. longis; clavulis  $\frac{1}{3}$ - $\frac{2}{3}$  ascomatae loculis, oblongis, ellipsoideis vel subcylindraceis, obtusis, vulgo compressis et saepe longitudinaliter canaliculatis, regularibus vel irregularibus contortisque, acute delimitatis, juniore dilute fuscis, seniore atro-virescentibus, siccate nigrescentibus, 0.5-3 cm. longis, 1.5-15 mm. latis; stipitibus cylindraceis vel superne compressis, glabris, levibus, nitidis, juniore dilute fuscis, seniore atro-virescentibus, siccate nigrescentibus, 0.5-2.5(-4) cm. longis, 1-5(-8) mm. crassis; ascis clavatis vel cylindraco-clavatis, apice rotundatis vel raro contractis, poro iodo caerulescentibus, 70-100  $\times$  7.5-10  $\mu$ , octosporis; sporis superne distichis, inferne monostichis, oblongo-fusiformibus vel fusiformibus, rectis vel curvatis, longe continuis, dein guttulis, demum 3-septatis, hyalinis, levibus, 11-18  $\times$  4-6  $\mu$ ; paraphysibus filiformibus, tenuissimis, ramosis, apice non incrassatis, rectis vel leviter curvatis, hyalinis.

Hab. ad terram udam in silvis, aestate-aetate autumnum.

Typus in ? Herb. PERSON.

Loc. typ.: ignotum.

Area distr.: Europa, America borealis, Asia orient. (Japonia).

Exempl. invest.:

Hokkaido—Kushiro: Akan (S. IMAI, Sept. 16, 1933). Ishikari: Nopporo (S. IMAI, Oct. 7, 1927; Oct. 6, 20, 1929; Sept. 28, Oct. 17, Nov. 9, 1930; Oct. 4, 11, 25, 1931; Oct. 2, 23, 1932; Oct. 15, 1933); Monte Soranuma (S. IMAI, Sept. 18, 1930). Iburi: Shikotsu (S. ITO, Oct. 11, 1927; S. IMAI, Sept. 9, 1935); Tôya (G. HAYASHI, Sept. 27, 1932). Oshima: Ôno-mura (S. IMAI, Sept. 21, 1935).

In his previous paper, the writer reported the extreme variability in color during the development of this fungus which had not yet been clearly recorded.

PERSON remarked "color fungi junioris dilute fuscis, seminoris atro-virens fere", and FRIES "colore instatu senescenti virescente-nigro", however, they merely wrote "ex olivaceo subfuligineus", or "fuligineo-olivaceum" respectively for the color, in diagnosis. Since then the majority of the authors have also written "smoky-olive" or "greenish-brown".

The writer has observed clearly in the field that the ascigerous portion of this fungus is at first madder-brown to diamine-brown in color, becoming snuff-brown or olive-brown, then through deep-olive or dark olive, finally to light danube-green; stipe is at first testaceous or walnut-brown above

and lighter below, becoming cinnamon or tawny-olive, then through mythe-green or dark greenish glaucous, to american green or dark american green finally; when dried the matured specimens become black in color.

Among the various color stages above mentioned, the fungus of the early bay-brown colored stage agrees with *Geoglossum olivaceum* var. *purpureum* CKE. and also with *Microglossum contortum* PK.; the fungus of the middle stage colored snuff-brown or olive-brown shows the usual form of the fungus which has been described by many authors, and the fungus in the final dark-olive to light danube-green colored stage may represent *M. nudipes* BOUD., but the latter species is larger in respect to the size of asci and spores. *Microglossum fusco-rubens* BOUD. may represent a fungus of this species in the middle stage of development, but the asci and spores are slightly larger than those of the present fungus. However, further critical studies on the relation between them are required.

The measurements of the asci and spores given by various authors for this fungus are as follows:

COOKE (1875)		spores 25 × 8 μ.
SACCARDO (1889)		spores 25 × 8 μ.
MASSEE (1895)		spores 15-20 × 5-6 μ.
" (1897)	asci 90-100 × 10-11 μ;	spores 15-19 × 5-6 μ.
REHM (1896)	asci 70-90 × 9-10 μ;	spores 12-15 × 5-6 μ.
DURAND (1908)	asci 75-100 × 9-10 μ;	spores 12-18 × 4-6 μ.
LLOYD (1916)		spores 12-16 × 5-6 μ.
IMAI (1938)	asci 70-100 × 7.5-10 μ;	spores 11-18 × 4-6 μ.
For <i>Microglossum contortum</i> :		
PECK (1898)	asci 87-112 × 7.5 μ;	spores 12.5-15 × 5-6 μ.
For <i>Microglossum obscurum</i> :		
PECK (1899)	asci 100-112 μ long;	spores 12-15 × 4-5 μ.

### Sect. *Ochroglossum* IMAI

*Microglossum* Sect. *Ochroglossum* IMAI, Bot. Mag. Tokyo, LII, 421, 1938.

Ascoma vulgo flavum, fulvum, cinnamomeo-brunneum. Paraphyses apicibus valde curvatae vel circinatae.

Typus: *Microglossum rufum* (SCHW.) UNDERW. \*

### *Microglossum rufum* (SCHW.) UNDERW.

*Geoglossum rufum* SCHW. Trans. Amer. Phil. Soc. IV, 181, 1834—CKE. Mycogr. I, 205, t.

96; f. 346, 1879.

*Clavaria contorta* (non HOLMSK. nec FR.) SCHW. Ibid. 182, 1834 (teste DURAND).

*Mitrula lutea* MONT. Ann. Sci. Nat., Bot. 4 sér. III. 91, 1855 (teste DURAND)—CKE. Mycogr. I, 103, t. 46, f. 179, 1876—SACC. Syll. Fung. VIII, 37, 1889.

*Geoglossum luteum* PK. 24 Ann. Rep. N. Y. State Mus. 94, t. 3, f. 20-24, 1872, (teste MASSEE et DURAND)—CKE. Mycogr. I, 8, t. 3, f. 12, 1875—LLOYD, Geoglossaceae, 6, f. 788-789, 1916.

*Mitrula lutescens* BERK. Hedwigia, XIV, 9, 1875 (teste MASSEE et DURAND)—CKE. Mycogr. I, 102, t. 45, f. 178, 1876—SACC. Syll. Fung. VIII, 37, 1889.

*Geoglossum pistillaris* BERK. et CKE. Mycogr. I, 206, t. 96, f. 348, 1879 (teste MASSEE et DURAND).

*Mitrula pistillaris* SACC. Syll. Fung. VIII, 38, 1889.

*Mitrula rufa* SACC. Ibid. 38, 1889—MASS. Ann. Bot. XI, 275, t. 12, f. 28-30, 1897—BURT, Rhodora, I, 65, 1899.

*Leptoglossum luteum* SACC. Ibid. 48, 1889—UNDERW. Minn. Bot. Stud. I, 496, 1896—HONE, Minn. Bot. Stud. III, 317, t. 3, f. 2, f. 5, f. 16-19, 1904.

*Xanthoglossum luteum* O. K. Rev. Gen. Pl. 875, 1891.

*Microglossum luteum* SCHROET. in ENGLER & PR. Nat. Pfl. Fam. I, 1, 164, 1894.

*Microglossum pistillare* SCHROET. Ibid. 164, 1894—UNDERW. Minn. Bot. Stud. I, 496, 1896.

*Microglossum lutescens* UNDERW. Minn. Bot. Stud. I, 496, 1896.

*Microglossum rufum* UNDERW. Ibid. 496, 1896—DURAND, Ann. Myc. VI, 406, t. 5, f. 9-14, t. 19, f. 207, 1908—MURRILL, Mycologia, VIII, 295, 1916—KAUFFM. Mycologia, IX, 160, 1917—OVERH. Mycologia, XIII, 28, 1921—TENG, Contr. Biol. Lab. Sci. Soc. China, Bot. VIII, 51, 1932—POVAH, Papers Mich. Acad. Sci. XX, 132, 1935—IMAI, Bot. Mag. Tokyo, LII, 421, 1938—WEHM. Canad. Journ. Research, XVIII, 540, 1940.

*Leptoglossum lutescens* REHM, Ann. Myc. II, 32, 1904.

*Leptoglossum lutescens* var. *mitruloides* REHM, Ibid. 32, 1904 (teste DURAND).

*Helote rufa* S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 147, 1932.

Nom. jap. *Ki-shamoji-take*,

Ascomatibus gregariis, solitariis vel subcaespitosis, clavatis, subcarnosis vel gelatinoso-carnosis, 2-6 cm. longis; clavulis  $\frac{1}{3}$ - $\frac{1}{2}$  ascomatae loculis, ellipsoideo-obovatis, oblongo-ellipsoideis aut subcylindraceis, obtusis, vulgo compressis vel longitudinaliter canaliculatis, glabris, laete flavo-vitellinis aut flavo-aurantiacis, siccate sordide flavo- vel rufo-brunnescentibus, acute delimitatis, 0.7-2 cm. longis, 3-10(-12) mm. latis; stipitibus cylindraceis, subaequalibus, flavis, clavula pallidioribus, vulgo prominente albo- vel flavulo-squamulosis, 1.5-4 cm. longis, 2-3 mm. crassis; ascis clavatis, apice contractis, poro iodo caerulescentibus, 92.5-140 × 10-12  $\mu$ , octosporis; sporis distichis,

cylindraceutis vel utrinque leviter contractis, rectis vel leviter curvatis, longe continuis, dein multiguttulatis, demum 5-10-septatis, hyalinis, levibus, (18-) 20-40  $\times$  5-6  $\mu$ ; paraphysibus filiformibus, apicibus leviter incrassatis et fortiter curvatis vel circinatis.

Hab. ad terram inter muscos vel ad truncos putridos, aestate—autumno.

Typus in Herb. Acad. Nat. Sci., Philadelphia, Pa., Amer. bor.

Local. typ.: Hope, New Jersey, Amer. bor.

Area distr.: America bor. et aust., Asia orient. (Japonia et Sina).



Fig. 2.

*Microglossum rufum* (Specimina in Prov. Kushiro).

Exempl. invest.:

Hokkaido—Kitami: Notoro (S. IMAI, Sept. 19, 1927); Oketo (S. IMAI, Sept. 20, 1927). Kushiro: Akan (S. IMAI, Sept. 15, 16, 1933; Sept. 21, 1934). Ishikari: Monte Taisetsu (S. IMAI, Sept. 5, 1940); Monte Soranuma (S. IMAI, Sept. 18, 1930); Nopporo (S. IMAI, Oct. 22, 1926; Aug. 7, Sept. 25, Oct. 7, 1927; Sept. 16, Oct. 6, 1929; Oct. 17, 1930; Aug. 16, Sept. 10, Oct. 8, 1931; Sept. 18, Oct. 23, 1932). Monte Teine (M. TERUI, Sept. 14, 1930). Iburi: Shikotsu (S. IMAI, Sept. 15, 1934); Tôya (G. HAYASHI, Sept. 27, 1932).

Honshû—Rikuchû: Morioka (K. SAWADA, Oct. 28, 1906). Shimo-

tsuke: Oku-nikkô (S. IMAI, Oct. 7, 1937). Kai: Nishinoumi-mura (S. IMAI, Oct. 4, 1940). Yamato: Nara (S. AKAI, Jul. 8, 1931, in Herb. HEMMI, Univ. Imp. Kyoto).

The present fungus is very distinct and easily distinguished, when fresh, by the vitelline-yellow or orange-yellow color of ascophore, the squamose stipe, as well as by the cylindrical septate spores and the curved, slightly thickened paraphyses. When dried it becomes darker with reddish color changing to ochraceous-orange, and finally to ferruginous-rufous or rufous.

Almost all synonyms indicating the colors above mentioned are probably described from the dried material.

The measurements of the asci and spores given by different authors are as follows:

For *Geoglossum rufum* or *Microglossum rufum*:

COOKE (1879)		spores 40-50 × 5 μ.
SACCARDO (1889)		spores 40-50 × 5 μ.
MASSEE (1897)	asci 115-140 × 10-12 μ;	spores 25-35 × 5-6 μ.
DURAND (1908)	asci 100-140 × 10-12 μ;	spores 18-38 × 5-6 μ.
IMAI (1938)	asci 92.5-140 × 10-12.5 μ;	spores 20-40 × 5-6 μ.

For *Geoglossum luteum* or *Leptoglossum luteum* or *Mitrula lutea*:

MONTAGNE (1855)	asci 80 μ long;	spores 20 × 5 μ.
PECK (1872)		spores 1/1000-1/800 inch.
COOKE (1875)		spores 0.05 × 0.01 mm.
" ( " )		spores 30 × 4 μ.
SACCARDO (1889)		spores 20 × 4 μ.
" "		spores 50 × 10 μ.
HONE (1904)		spores 28-38 × 5-6 μ.
LLOYD (1916)		spores 28-32 × 6 μ.

For *Mitrula lutescens*:

COOKE (1875)		spores 35 μ long.
--------------	--	-------------------

For *Geoglossum pistillaris*:

COOKE (1879)		spores 35 × 4 μ.
--------------	--	------------------

For *Leptoglossum lutescens* var. *mitruloides*:

REHM (1904)	asci 120 × 12 μ;	spores 20-25 × 4-5 μ.
-------------	------------------	-----------------------

As has been pointed out by DURAND, the measurements of the spores given by COOKE for *Geoglossum rufum* and *G. luteum* in his Mycographia I, and repeated by SACCARDO in his Sylloge are entirely erroneous, because of which REHM mistakenly established a synonym, *Leptoglossum lutescens*

var. *mitruloides*.

The fungus is widely distributed in North America, especially in the eastern United States, and it is not confined only to the temperate zone. In eastern Asia, the fungus is distributed in Japan and China, but in the latter country there is only one report by TENG basing on one collection in Chekiang. However, as far as the writer is aware, it is not distributed in Europe. Dried material of *Mitrula paludosa* may have been often misidentified with *Mitrula pistillaris* BERK. in Europe.

***Microglossum fumosum* (PECK) DURAND**

*Leptoglossum luteum* var. *fumosum* PK. 43 Ann. Rep. N. Y. State Mus. 40, 1890.

*Leptoglossum fumosum* PK. 116 Bull. N. Y. State Mus. 25, 1907—SACC. Syll. Fung. XXII, 604, 1913.

***Microglossum fumosum*** DURAND, Ann. Myc. VI, 408, t. 5, f. 15-16, t. 19, f. 203-205, 1908—IMAI, Bot. Mag. Tokyo, LII, 422, 1938.

*Helote fumosa* S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 147, 1932.

Nom. jap. *Fuki-iro-shamojitake*.

Ascomatibus caespitosis, gregariis vel solitariis, clavatis, robustis, 2-9 cm. longis; clavulis obovatis, ellipsoideis vel oblongis, apice rotundatis, seniore compressis et longitudinaliter canaliculatis vulgoque subcontortis,  $\frac{1}{3}$ - $\frac{1}{2}$  ascomatae loculis, leviter vel vix delimitatis, ochraceis vel flavo-argillaceis, dein infuscatis, 1-4 cm. longis, 0.3-1.5 cm. latis; stipitibus cylindraceis vel compressis, 1-6 cm. longis, 2-6 mm. crassis, clavula pallidioribus, primo flavidulis vel argillaceis, dein cinnamomeis, leviter squamulosis vel levibus nitidisque, fibrillosis; ascis clavatis, apice contractis, poro iodo caerulescentibus, 100-150 × 10-12  $\mu$ , octosporis; sporis distichis, cylindraceis, obtusis vel utrinque leviter contractis, vulgo leviter curvatis, hyalinis, levibus, primo continuis, demum 7-15-septatis, 20-45(-50) × 5  $\mu$ ; paraphysibus filiformibus, septatis, apicibus leviter incrassatis et fortiter curvatis vel circinatis.

Hab. ad truncos putridos, vel in humo, aestate—autumno.

Typus in Herb. New York State Mus., Albany, N. Y., Amer. bor.

Local. typ.: Adirondack Mts., N. Y., Amer. bor.

Area distr.: America borealis, Asia orient. (Japonia).

Exempl. invest.:

Hokkaido—Kushiro: Akan (S. IMAI, Sept. 15, 1933). Ishikari: Monte

Soranuma (Y. TOCHINAI & S. IMAI, Sept. 17, 1930). Iburi: Tôya (Y. TOCHINAI & G. HAYASHI, Sept. 27, 1932).

Honshû—Shinano: Azumi-mura (S. IMAI, Sept. 10, 1938).

The present species is easily distinguished from *Microglossum rufum* which to the naked eyes appears allied, by the ochraceous-buff colored, larger and more robust ascophores and almost smooth stipe. In the Japanese material there is less distinction by the measurements of the spores between the two species, but they are, slightly narrower in this fungus.

In material at hand, the clavula is, when young, antimony-yellow, or ochraceous-buff, becoming cinnamon-buff or yellow-ocher, at length pinkish-cinnamon, and the stipe is at first warm-buff then clay-color or cinnamon-brown. The dried specimens of this fungus become darker than those of *M. rufum*.

DURAND gives the measurements for asci 100-150 × 10-12  $\mu$ , for spores 20-50(35-43) × 5  $\mu$ .

The present fungus is distributed in the eastern United States and Japan.

### *Microglossum longisporum* DURAND

*Microglossum longisporum* DURAND, Ann. Myc. VI, 409, t. 5, f. 17-18, t. 19, f. 206, 1908; Mycologia, XIII, 185, 1921—SACC. Syll. Fung. XXII, 602, 1913—IMAI, Bot. Mag. Tokyo, LII, 423, 1938.

*Helote longispora* S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 147, 1932.

Nom. jap. *Mimizu-take*.

Ascomatibus gregariis, subcaespitosis vel solitariis, clavatis, saepe curvatis vel contortis vel deformibus, cinnamomeo-umbrinis vel atrato-lateritiis, ceraceis firmisque sed subtremulosis subviscidisque, 1.3-6 cm. longis; clavulis  $\frac{1}{3}$ - $\frac{1}{2}$  ascomatae loculis, ovatis, oblongis vel ellipsoideis, saepe deformibus, obtusis, plus minusve compressis et longitudinaliter canaliculatis, vix vel leviter distinctis, basi a stipite truncato-liberis, 0.5-2.5 cm. longis, 2-10 mm. crassis; stipitibus clavula leviter pallidioribus, cylindraceutis, plus minusve compressis, obscure innato-fibrillosis, dein longitudinaliter rugulosis, verrucosis papillosisque, dein subglabrescentibus, 2-4 cm. longis, 2-5 mm. crassis; ascis cylindraceuto-clavatis, apicibus rotundatis vel parce attenuatis, poro iodo caerulescentibus, 100-130(-140) × 10-12(-15)  $\mu$ , vulgo octosporis; sporis biformibus: duabus longis, parallele positis, hyalinis, levibus, cylindraceutis,

vel medio vix parceve incrassatis, utrinque rotundatis, rectis vel curvatis, primo continuis, dein multiguttulatis, demum multiseptatis (14-16-septatis), 40-100 × 4-6  $\mu$ ; sex (raro parce) similibus, brevibus, continuis, ad apicem asci irregulariter positus, 7-16(-18) × 3  $\mu$ ; paraphysibus filiformibus, hyalinis, sursum leviter incrassatis, subrectis, curvatis vel circinatis.

Hab. ad terram inter folia dejecta, autumnno.

Typus in Herb. DURAND, in Herb. Univ. Cornell, N. Y., Amer. bor.

Loc. typ.: 6-mile Cr., Ithaca, N. Y., Amer. bor.

Area distr.: America bor., Asia orient. (Japonia).

Exempl. invest.:

Hokkaido—Iburi: Shikotsu (S. IMAI, Sept. 19, 1931).

Honshû—Kii: Shimo-marô, prope Tanabe (K. MINAKATA, Oct. 2, 1917, ex Herb. MINAKATA).

This striking fungus is easily distinguished by the cinnamon-brown colored ascophores which much simulate the earth-worm in posture, as well as by the dimorphic spores.

This interesting species is also confined in distribution, as far as the writer is aware, only to the eastern United States of North America and Japan of eastern Asia.

#### Sect. **Melanoglossum** IMAI, sect. nov.

*Corynetes* (ut gen.) HAZSL. M. T. Akad. ért. A. Termés. Kor. XI, - (8), 1881 (sec. DURAND) —DURAND, Ann. Myc. VI, 412, 1908—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 146, 1932.

*Leptoglossum* Sect. *Euleptoglossum* SACC. Syll. Fung. VIII, 47, 1889.

Ascoma vulgo atropurpureum, atro-brunneum, atrum vel spadiceum. Paraphyses apicibus rectae, curvatae vel circinatae.

Typus: *Microglossum atropurpureum* (PERS. ex FR.) KARST.

Differing from the other two sections, the paraphyses of the members of this section are variable in the character of the apices, from straight to circinate. *Mitrula globosa* SOMMERF., though it is said to be spadiceous in color, belongs here, and is thus called *Microglossum globosum* (SOMMERF.) IMAI.

#### **Microglossum atropurpureum** (PERS. ex FR.) KARST.

*Clavaria nitrata* HOLMSK. Beata Ruris Fung. Dan. I, 21, t. 8, 1790.

?*Clavaria atropurpurea* GMEL. in LINN. Syst. Nat. II, 1443, 1791.

- Geoglossum purpurascens* PERS. Comm. Fung. Clav. 39, 1797.
- Geoglossum atropurpureum* PERS. Obs. Myc. II, 62, t. 3, f. 5, 1799; Syn. Fung. 609, 1801.
- Geoglossum atropurpureum* FR. Syst. Myc. I, 490, 1821; Epicr. Myc. 582, 1838; Summa Veg. Scand. 347, 1849—PERS. Myc. Eur. I, 195, 1822—QUÉL. Ench. Fung. 266, 1886—LLOYD, Geoglossaceae, 8, 1916—COOL, Meded. Rijks Herb. Leiden, No. 51, 4, 1925.
- Leotia atropurpurea* CORDA, Icon. Fung. V, 79, t. 9, f. 71, 1842.
- Mitrula glabra* KARST. Myc. Fenn. I, 30, 1871.
- Geoglossum microsporum* CKE. et PK. 25 Ann. Rep. N. Y. State Mus. 97, 1873 (teste DURAND)—CKE. Mycogr. I, 8, t. 3, f. 11, 1875—PHILLIPS, Brit. Disc. 39, 1887—W. G. SM. Outl. Brit. Fung. Suppl. 350, 1891.
- Geoglossum Hookeri* CKE. Hedwigia XIV, 9, 1875 (teste MASSEE); Mycogr. I, 10, t. 4, f. 15, 1875.
- Geoglossum microsporum* var. *tremulosum* CKE. Grevillea, IV, 109, 1876.
- Geoglossum tremulosum* CKE. Mycogr. I, 206, t. 96, f. 347, 1878 (teste DURAND)—PHILLIPS, Brit. Disc. 39, 1887—W. G. SM. Outl. Brit. Fung. Suppl. 350, 1891.
- Corynetes microsporus* HAZSL. M. T. Akad. ért. A. Termés. Kor. XI, -(8), 1881 (sec. DURAND).
- Microglossum Hookeri* SACC. Bot. Centralbl. XVIII, 214, 1884; Syll. Fung. VIII, 39, 1889.
- Leptoglossum microsporum* SACC. Bot. Centralbl. XVIII, 214, 1884; Syll. Fung. VIII, 47, 1889—UNDERW. Minn. Bot. Stud. I, 496, 1896.
- Microglossum atropurpureum* KARST. Rev. Mon. Asc. 110, 1885—SACC. Syll. Fung. VIII, 40, 1889—SCHROET. Pilze Schles. II, 18, 1893; in ENGLER & PR. Nat. Pfl. Fam. I, 1, 164, 1894—REHM, Pilze Deut., Hyst. & Disc. 1152, 1896—A. L. SM. Trans. Brit. Myc. Soc. III, 220, 1910—RAMSB. Trans. Brit. Myc. Soc. IV, 370, 1914.
- Leptoglossum tremulosum* SACC. Syll. Fung. VIII, 47, 1889; Bull. Soc. Myc. Fr. XII, 74, 1896—UNDERW. Minn. Bot. Stud. I, 497, 1896—RAMSB. Trans. Brit. Myc. Soc. IV, 370, 1914.
- Microglossum partitum* PAT. Rev. Myc. XII, 135, t. 107, f. 2, 1890—SACC. Syll. Fung. X, 2, 1892—SCHROET. in ENGLER & PR. Nat. Pfl. Fam. I, 1, 164, 1894—YASUDA, Bot. Mag. Tokyo, XXXI, (143), 1917.
- Xanthoglossum microsporum* O. K. Rev. Gen. Pl. 875, 1891.
- Mitrula microspora* MASS. Brit. Fung. Fl. IV, 483, 1895; Ann. Bot. XI, 281, t. 13, f. 55-57, 1897.
- Mitrula microspora* var. *tremulosa* MASS. Ibid. IV, 484, 1895; Ann. Bot. XI, 282, 1897.
- Mitrula purpurascens* MASS. Ann. Bot. XI, 266, t. 12, f. 27, 1897.
- Mitrula partita* MASS. Ibid. XI, 283, 1897.
- Corynetes purpurascens* DURAND, Ann. Myc. VI, 413, t. 6, f. 36-39, 1908.
- Corynetes atropurpureus* DURAND, Ann. Myc. VI, 414, t. 6, f. 27-35, 1908—LIND, Dan. Fung. 89, 1913—S. ITO & IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932—IMAI, Ann. Myc. XXXVIII, 273, 1940.
- Nom. jap. *Tengu-no-kôgai*.

Ascomatibus solitariis, gregariis vel non numquam caespitosis, clavatis, nigricantibus vel nigris, 2-8 cm. longis; clavulis  $\frac{1}{3}$ - $\frac{1}{2}$  ascomatae loculis, anguste clavato-oblongis, obtusis, raro apice lobatis vel furcatis, vulgo compressis, non vel vix deliminatis, 1-3 cm. longis, 5-10 mm. crassis; stipitibus tenuibus, atro-brunneis vel nigris, minute squamulosis vel sublevibus; ascis clavatis, apice obtusis sed leviter contractis, poro iodo caerulescentibus, (70-)100-150 × 8-10(-12)  $\mu$ , octosporis; sporis distichis, hyalinis, levibus, cylindraceutis, utrinque obtusis sed leviter contractis, rectis vel leviter curvatis, primo continuis, dein multiguttulatis, demum multiseptatis, 20-37.5(-40) × 3.5-5(-6)  $\mu$ ; paraphysibus filiformibus, hyalinis, ramosis, rectis vel curvatis, apice non vel leviter vel abrupte obovato-piriforme incrassatis, sursum cum ascis epithecio vinoso-brunneo amorpho cohaerentibus.

Hab. ad terram in silvis, autumno.

Typus in Herb. PERSOON, in Rijks Herb., Leiden.

Local. typ.: ignotum.

Area distr.: Europa, America bor., Asia orient. (Japonia), Ins. Canari.

Exempl. invest.:

Hokkaido—Ishikari: Monte Teine (Y. TOKUNAGA, Sept. 23, 1929); Nopporo (S. IMAI, Sept. 28, Oct. 17, 1930; Oct. 11, 1931).

Honshû—Rikuzen: Sendai (A. YASUDA, Oct. 15, 1915, in Herb. YASUDA, in Herb. Tokyo Sci. Mus.).

Regarding the adoption of the real specific name to this fungus there has been much confusion. This confusion may be mainly caused by the wide variability of the size and septation of spores.

The measurements of the asci and spores given by various authors are as follows:

For *Geogl. microsporum*, *Leptogl. microsporum* or *Mitrula microspora*:

COOKE (1875)	spores 50 × 10 $\mu$ , 7-septate.
PHILLIPS (1887)	spores 50 × 10 $\mu$ , 7-septate.
SACCARDO (1889)	spores 50 × 10 $\mu$ , 7-septate.
MASSEE (1895)	spores 30-40 × 5-6 $\mu$ , 5-7-septate.
" (1897)	asci 115-130 × 12 $\mu$ ; spores 28-40 × 5 $\mu$ , 3-5-7-septate.

For *Geoglossum Hookeri* or *Microglossum Hookeri*:

COOKE (1875)	spores 30-35 $\mu$ long, continuous.
" ( " )	spores 0.025 mm. long.
SACCARDO (1889)	spores 25 × 4-5 $\mu$ , continuous.

For *Geoglossum tremulosum* or *Leptoglossum tremulosum*:

- COOKE (1879) spores  $30-32 \times 5 \mu$ , 5-7-septate.  
 PHILLIPS (1887) spores  $30-32 \times 5 \mu$ , 5-7-septate.  
 SACCARDO (1889) spores  $30-32 \times 5 \mu$ , 5-7-septate.  
 " (1896) asci  $98-100 \times 8-10 \mu$ ; spores  $30-35 \times 4-5 \mu$ , 3-septate.

For *Microglossum atropurpureum* or *Geoglos. atrop.* or *Coryn. atrop.*:

- SACCARDO (1889) spores  $30 \times 4-6 \mu$ , guttulate.  
 SCHROETER (1893) asci  $70-80 \times 8-10 \mu$ ; spores  $22-23 \times 4-6 \mu$ .  
 REHM. (1896) asci  $70-90 \times 8-10 \mu$ ; spores  $22-33 \times 4-6 \mu$ , continuous.  
 SMITH (1910) asci  $70-90(-100) \times 8-10 \mu$ ; spores  $22-33 \times 4-6 \mu$ , guttulate.  
 COOKE (1875) spores  $30-35 \mu$  long, guttulate.  
 LLOYD (1916) spores  $25-30 \times 4-6 \mu$ , continuous.  
 DURAND (1908) asci  $100-127 \times 10 \mu$ ; spores  $25-35 \times 3-4 \mu$ , 10-septate.

For *Mitrula purpurascens* or *Corynetes purpurascens*:

- MASSEE (1897) asci  $80-100 \times 10 \mu$ ; spores  $24-30 \times 5 \mu$ , 3-5-septate.  
 DURAND (1908) asci  $105-120 \times 10-12 \mu$ ; spores  $20-37 \times 5-6 \mu$ , 6-septate.

For *Microglossum partitum*:

- PATOUILLARD (1890) asci  $130 \times 10 \mu$ ; spores  $20-30 \times 3-6 \mu$ , continuous.  
 YASUDA (1917) asci  $120 \times 10 \mu$ ; spores  $20-35 \times 3-5 \mu$ , continuous.

In 1895, MASSEE certified, after the examination of every specimen in Kew from America, that the spore-measurement given by COOKE for *Geoglossum microsporum*,  $50 \times 10 \mu$ , is a mistake, and gave  $30-40 \times 5-6 \mu$  instead. The spore-septation is widely variable depending upon the stage of development. The spores are at first continuous and granulate, then becoming multiguttulate, and finally many septate. Generally speaking, the guttulation of spores in this family suggests that the spores become finally septate. In immature specimens, the spores are merely continuous and granulose or guttulate, and accordingly the genus *Leptoglossum* might be mistakenly considered by some to be valid.

As to the result of the examination of authentic specimens of *Corynetes purpurascens* and *C. atropurpureus*, DURAND recognised that the former differs from the latter in the more abruptly thickened tips of the paraphyses. He, accordingly, separated them as two distinct species.

During the examination of the fungi of this genus, however, the present writer has frequently on a slide prepared from a single specimen observed cases where filiform paraphyses, which are scarcely or very slightly thickened, are mixed with clavate to piriformly thickened paraphyses.

The color of the ascophore seems to be changed slightly in the age of development or in individuals. Other essential characters of the two

species are almost indistinguishable from each other. Therefore the writer united the two as a single species.

Though it has been described as atropurpureus, the clavula of this fungus is black when matured or dried.

As far as the diagnosis and figures are concerned, *Microglossum partitum* PAT. is nothing other than the present species, but a form splitting at the apex. *Microglossum partitum* of YASUDA from Japan is also nothing any other than the present fungus.

***Microglossum robustum*** (DURAND) A. L. SM. et RAMSB.

*Corynetes robustus* DURAND, Ann. Myc. VI, 416, t. 6, f. 40-44, t. 19, f. 198-202, 1908—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932—KANOUSE, Papers Mich. Acad. Sci. XIX, 104, 1934—MAINS, Papers Mich. Acad. Sci. XX, 82, 1935—WEHM. Canad. Journ. Research, XVIII, 539, 1940—OVERH. Mycologia, XXXII, 252, f. 1, 1940.

*Leptoglossum robustum* SACC. et TROTT. in SACC. Syll. Fung. XXII, 604, 1913.

***Microglossum robustum*** A. L. SM. et RAMSB. Trans. Brit. Myc. Soc. IV, 320, 1914.

Nom. jap. *Maru-tengu-no-kôgai*.

Ascomatibus solitariis, gregariis vel saepe caespitosis, atris vel brunneo-atris, clavatis, robustis, 2-8 cm. longis; clavulis  $\frac{1}{4}$ - $\frac{1}{2}$  ascomatae loculis, 8-30 mm. longis, 4-15 mm. crassis, ellipsoideis, piriformi-ellipsoideis, obtusis, non vel leviter distinctis, atris vel atris olivaceo-brunneo-tinctis, vulgo compressis longitudinaliterque canaliculatis, non-numquam contortis; carne atro-brunnea; stipitibus cylindraccis vel compressis, clavula pallidioribus, brunneo-atris, nitentibus, hygrophanis, sursum leviter squamulosis, 1-4 cm. longis, 3-8 mm. crassis; ascis clavatis, crassis, sessilibus vel breve stipitatis, apice contractis, poro iodo caerulescentibus, 100-125(-150)  $\times$  10-12.5(-15)  $\mu$ , octosporis; sporis sursum distichis, deorsum monostichis, hyalinis, levibus, cylindraccis, utrinque leviter contractis, primo continuis, dein multiguttulatis, demum 7-11-septatis, rectis vel curvatis, 22.5-37.5(-50)  $\times$  (4-)5-5.5(-6)  $\mu$ ; paraphysibus filiformibus, hyalinis, ramosis, 2-3  $\mu$  crassis, apice leviter incrassatis et rectis vel curvatis, sursum non vel leviter cohaerentibus.

Hab. ad terram in silvis, autumnno.

Typus in Herb. DURAND, in Univ. Cornell, Ithaca, N. Y., Amer. bor.

Loc. typ.: Blowing Rock, North Carolina, Amer. bor.

Area distr.: America borealis, Europa (Anglia), Asia orient. (Japonia).

Exempl. invest.:

Hokkaido—Ishikari: Nopporo (S. IMAI, Oct. 2, 1932).

The present fungus is closely allied to *M. atropurpureum*, from which it is easily distinguished by the more robust and caespitose habit, as well as by the larger spores and absence of the conspicuous vinaceous-brown epithecium so noticeable in that species.

DURAND gives the measurements of the asci and spores as follows: asci 100-150(120-135) × 10-15 μ; spores 25-50(30-40) × 4-6 μ.

As far as the writer is aware, the present fungus is distributed in the eastern United States of North America, England and Japan. It is highly probable that the species is more widely distributed in the North Hemisphere than the records indicate.

### *Microglossum arenarium* ROSTR.

*Microglossum arenarium* ROSTR. Med. om. Grønland, III, 606, 1891; Bot. Tidssk. XVIII, 76, 1892; Beih. Bot. Centralbl. III, 3, 1893—SACC. Syll. Fung. XI, 392, 1895—REA, Trans. Brit. Myc. Soc. IV, 196, 1913.

*Leptoglossum latum* PK. Bull. Torrey Bot. Club, XXII, 210, 1895 (teste DURAND)—SACC. Syll. Fung. XIV, 743, 1899.

*Mitrula arenaria* MASS. Ann. Bot. XI, 283, 1897.

*Corynetes arenarius* DURAND, Ann. Myc. VI, 417, t. 6, f. 45-49, t. 18, f. 194-197, 1908—LIND, Dan. Fung. 88, t. 1, f. 8-9, 1913—LUYK, Kruidk. Arch. Jaarg. 1918, 125, f. 4, 1919; Meded. Rijks Herb. Leiden, No. 39, 2, f. 2, 1919—IMAI, Ann. Myc. XXXVIII, 274, f. 3, 1940.

Nom. jap. *Ko-tengu-no-kôgai*.

Ascomatibus solitariis, gregariis vel caespitosis, late clavatis vel longe clavatis vel raro deformibus, atris, 1-4 cm. vel ultra longis; clavulis  $\frac{1}{3}$ - $\frac{1}{2}$  ascomatae loculis, 0.5-2 cm. latis, clavatis vel oblongis, raro irregulariter lobatis, irregulariter curvatis vel contortis, compressis, canaliculatis, atris; stipitibus brunneo-atris vel olivaceo-atris, clavula brunneoribus, pruinosis vel squamulosis; ascis clavato-cylindraccis vel longe subfusiformibus, crassis, sessilibus vel breve stipitatis, apice contractis, poro iodo caerulescentibus, 100-150 × 12-18 μ, octosporis; sporis sursum distichis, deorsum monostichis, hyalinis, levibus, cylindraccis vel oblongo-cylindraccis, utrinque rotundatis, rectis vel curvatis, (25-)30-(35-)50 × 5-6.5 μ, longe continuis, demum 3-4-septatis; paraphysibus filiformibus, robustis, septatis, subolivaceo-fuliginis vel brunneis, ascis longioribus, apicibus vix vel clavate incrassatis et rectis vel curvatis, membrano crasso.

Hab. in arenosis vel ad terram in silvis, autumnno.

Typus in Herb. ROSTRUP, Mus. Bot., Univ. Copenhagen, Dania.

Loc. typ.: Greenland.

Area distr.: Greenland, Europa (Dania, Norvegia, Anglia), America bor. (Labrador, Newfoundland), Asia orient. (Japonia).

Exempl. invest.:

Hokkaido—Iburi: Shikotsu (S. IMAI, Sept. 19, 1931).

The present fungus is easily distinguished by the long, conspicuous brown paraphyses.

The measurements of the asci and spores given by different authors are as follows:

ROSTRUP (1891)	asci $100 \times 12-13 \mu$ ;	spores $25-30 \times 4-6 \mu$ .
MASSEE (1897)	asci $100 \times 12-13 \mu$ ;	spores $25-30 \times 4-6 \mu$ .
DURAND (1908)	asci $100-125 \times 12-15 \mu$ ;	spores $25-35 \times 6 \mu$ .
REA (1913)	asci $100-125 \times 12-15 \mu$ ;	spores $25-35 \times 6 \mu$ .
LUYK (1919)	asci $130-140 \times 16-18 \mu$ ;	spores $32-40 \times 4-6 \mu$ .
	asci $100-150 \times 12-18 \mu$ ;	spores $25-40 \times 3.5-6 \mu$ .
IMAI (1940)	asci $100-125 \times 12.5-17.5 \mu$ ;	spores $30-36.5 \times 5-6.5 \mu$ .

For *Leptoglossum latum*:

PECK (1895)	asci $0.0045-0.005 \times 0.0005$ in.;	spores $0.001-0.0016$ $\times 0.0002-0.00024$ in.
SACCARDO (1899)	asci $118-131 \times 13 \mu$ ;	spores $26-40 \times 5.25-6.25 \mu$ .

In the present material, one to three septations of the spore are observed, but as suggested by DURAND, it becomes probably more septate.

As far as the writer is aware, this boreal species is distributed in Europe in Holland, Denmark, Finland, England, and East Greenland, Labrador, Newfoundland and Michigan in North America, and Hokkaido, Japan in eastern Asia.

#### Trib. **Spathularieae** IMAI, trib. nov.

Ascoma spathulatum, laeticoloratum. Sporae aciculares vel clavato-filiformes, hyalinae; cetera ut in Subfamilia.

Typus: *Spathularia* PERS. ex FR.

#### **Spathularia** PERS. ex FR.

*Spathularia* PERS. in ROEMER N. Mag. Bot. I, 116, 1794 (sec. DURAND); Comm. Fung. Clav. 34, 1797; Syn. Fung. 610, 1801—NEES, Syst. Pilze, 171, 1817.

*Spathularia* FR. Syst. Myc. I, 490, 1821; Elench. Fung. I, 234, 1828—PERS. Myc. Eur. I, 197, 1822—BERK. in SMITH Engl. Fl. V, 2, 179, 1836; Outl. Brit. Fung. 360, 1860—BONORD.

Handb. Allgem. Myk. 206, 1851—KICKX, Fl. Crypt. Flandr. I, 501, 1867—CKE. Handb. Brit. Fung. 661, 1871; Mycogr. I, 201, 1878—KARST. Myc. Fenn. I, 6, 1871—GILL. Disc. Fr. 26, 1879—BOUD. Bull. Soc. Myc. Fr. I, 111, 1885; Hist. Class. Disc. Eur. 87, 1907—SACC. Bot. Centralbl. XVIII, 214, 1884; Syll. Fung. VIII, 48, 1889—PHILLIPS, Brit. Disc. 30, 1887—SCHROET. Pilze Schles. II, 19, 1893; in ENGLER & PR. Nat. Pfl. Fam. I, 1, 166, 1894—MASS. Brit. Fung. Fl. IV, 485, 1895; Ann. Bot. XI, 253, 1897—REHM, Pilze Deut., Hyst. & Disc. 1158, 1896—SEEVER, Bull. Lab. Nat. Hist., State Univ. Iowa, V, 25, 1904—DURAND, Ann. Myc. VI, 441, 1908—LLOYD, Geoglossaceae, 13, 1916—LUIJK, Kruidk. Arch. Jaarg. 1918, 137, 1919—BRES. Icon. Myc. XXIV, 118, 1932—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 145 & 147, 1932.

*Spathulea* FR. Syst. Orb. Veg. I, 89, 1825; Summa Veg. Scand. 347, 1849—RABENH. Deuts. Krypt. Fl. I, 330, 1844.

*Mitrula* FR. Epicr. Myc. 583, 1838, pro parte—QUÉL. Champ. Jura Vosg. II, in Mém. Soc. D'Emul. Montb. 2 sér. V, 385, 1873, pro parte; Ench. Fung. 269, 1886, pro parte.

*Mitrulopsis* PECK, Bull. Torrey Bot. Club, XXX, 100, 1903.

Ascoma carnosum, laete coloratum, rectum, compresso-spathulatum, stipitatum; clavula vulgo spathulata, lateraliter compressissima, vulgo ad positus oppositus stipitis decurrens, distincta. Asci clavati, inoperculati, octospori; sporae fasciculatae, aciculares vel clavato-filiformes vel filiformes, demum multiseptatae, hyalinae, leves; paraphyses praesentes, filiformes, valde ramosae.

Typus: *Spathularia flavida* PERS. ex FR.

In 1825, FRIES changed the generic name, *Spathularia*, to *Spathulea* because of the presence of an antedated homonym in the zoological field, and later, in 1838, he included a member of this genus into *Mitrula* which it somewhat resembles in the macroscopic features, but that is not acceptable.

According to DURAND's examination of the type, *Mitrulopsis* of PECK, which is said to be aparaphysate and to have filiform spores, is nothing more than the same as the present genus.

#### Clavis specierum

1. Stipes pallidus vel flavidulus, clavula pallidior ..... *S. flavida*.
2. Stipes badius, clavula obscurior, vulgo rugulosus ..... *S. velutipes*.

#### *Spathularia flavida* PERS. ex FR.

*Eivella Clavata* SCHAEFF. Fung. Bavar. IV, Index 100, t. 149, 1774.

*Clavaria spathulata* MUELL. Fl. Dan. t. 658, 1775.

*Clavaria spathula* DICKS. Crypt. Brit. I, 21, 1785—SOW. Engl. Fung. t. 35, 1797.

*Helvella feritoria* BOLT. Hist. Fung. Halif. t. 97, 1789.

*Spathularia flavida* PERS. in ROEMER N. Mag. Bot. I, 116, 1794 (sec. DURAND); Tent. Disp. Fung. 36, 1797; Comm. Fung. Clav. 34, 1797; Syn. Fung. 610, 1801—NEES, Syst. Pilze, 171, t. 17, f. 156, 1817.

*Helvella spatulata* SOW. Engl. Fung. t. 35, 1797.

*Spathularia flava* SWARTZ, Vet. Akad. Handl. 10, 1812.

***Spathularia flavida*** FR. Syst. Myc. I, 491, 1821—PERS. Myc.-Eur. I, 197, 1822—BERK. in SMITH Engl. Fl. V, 2, 179, 1836; Outl. Brit. Fung. 360, t. 21, f. 7, 1860—KICKX, Fl. Crypt. Flandr. I, 501, 1867—CKE. Handb. Brit. Fung. 661, f. 326, 1871; Mycogr. I, 203, t. 95, f. 342, 1878—KARST. Myc. Fenn. I, 27, 1871—GILL. Disc. Fr. 26, cum icone, 1879—PHILLIPS, Brit. Disc. 30, 1887—JACZEWS. Bull. Soc. Myc. Fr. IX, 218, 1893—L. MAIRE, Bull. Soc. Myc. Fr. XXVI, 264, 1910—LIND, Dan. Fung. 90, 1913—LLOYD, Geoglossaceae, 13, f. 795, 1916—LUIJK, Kruidk. Arch. Jaarg. 1918, 137, 1919—COKER, Journ. Elisha Mitchell Sci. Soc. XLIII, 143, t. 19, 1927—S. ITO & IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 147, 1932—HEIM, Fungi Iberici, 31, 1934—POVAH, Papers Mich. Acad. Sci. XX, 132, 1935—R. MAIRE, Fungi Catal. 24, 1937—IMAI, Ann. Myc. XXXVIII, 271, 1940—WEHM, Canad. Jourp. Research, XVIII, 540, 1940.

*Spathulea flavida* FR. Syst. Orb. Veg. I, 89, 1825; Summa Veg. Scand. 347, 1849—RABENH. Deuts. Krypt. Fl. I, 330, 1844—FUCK. Symb. Myc. 332, 1869.

*Mitirula spathulata* FR. Epicr. Myc. 583, 1838—QUÉL. Champ. Jura Vosg. II, in Mém. Soc. D'Emul. Montb. 2 sér. V, 385, 1873; Ench. Fung. 269, 1886.

*Spathularia flavida* β *crispa* CORDA, Icon. Fung. II, 36, t. 15, f. 125, 1838.

*Spathularia clavata* SACC. Mich. II, 77, 1882; Syll. Fung. VIII, 48, 1889—SCHROET. Pilze Schles. II, 20, 1893; in ENGLER & PR. Nat. Pfl. Fam. I, 1, 166, f. 138, A, D, E, 1894—MASS. Brit. Fung. Fl. I, 485, cum fig. 1895; Ann. Bot. XI, 254, t. 13, f. 50-53, 1897—REHM, Pilze Deut., Hyst. & Disc. 1158, cum fig. 1896—BURT, Rhodora, I, 64, t. 4, f. 7, 1899—YASUDA, in MATSUM. & MIYOS. Crypt. Jap. Icon. Ill. I, t. 49, 1900; Bot. Mag. Tokyo, XXVIII, (31), 1914—HONE, Minn. Bot. Stud. III, 315, t. 3, f. 1, t. 5, f. 13-15, 20, 1904—SEEVER, Bull. Lab. Nat. Hist., State Univ. Iowa, V, 252, t. 1, f. 1, 1904—DURAND, Ann. Myc. VI, 441, t. 10, f. 98-100, t. 22, f. 220, 1908—KAWAM. Ill. Jap. Fung. t. 2, f. 19-24, 1912; Jap. Fung. no. 77, 1929—KILLERM. Krypt. Forsch. No. 3, 150, 1918—ZELLER, Mycologia, XIV, 176, 1922—BISBY, Mycologia, XVI, 124, 1924—BRES. Icon. Myc. XXIV, t. 1186, 1932—KOBAYASI, Nippon Inkwas. Dukan, 315, t. 148, 1939.

*Spathularia clavata* var. *plicata* SACC. Ibid. VIII, 49, 1889.

?*Spathularia linguata* JOHNSON, Bull. Minn. Acad. Nat. Soc. I, 370, 1880 (sec. DURAND).

*Spathularia flavida* var. *rugosa* PECK, 39 Ann. Rep. N. Y. State Mus. 58, 1886.

*Spathularia rugosa* PECK, 50 Ann. Rep. N. Y. State Mus. 118, 1897 (teste DURAND)—SACC. Syll. Fung. XIV, 744, 1899.

*Mitrulopsis flavida* PECK, Bull. Torrey Bot. Club, XXX, 100, 1903 (teste DURAND)—SACC. Syll. Fung. XVIII, 10, 1906.

Nom. jap. *Hera-take*.

Ascomatibus gregariis vel solitariis, raro subcaespitosis, spathulatis, carnosis, 2-10 cm. longis, juniore vivove pallidis, dein flavidulis vel brunneolis; clavulis  $\frac{1}{3}$ - $\frac{1}{2}$  ascomatae loculis, lateraliter compressissimis, formis variis ut plurimum spathulatis raro ovoideis, subrotundatis, subclavatis vel contortis, apice obtusis vel rotundatis, levibus vel undulatis vel radiatim rugosis, vulgo ad positus oppositos stipitis decurrentibus, glabris; stipitibus teretis vel subcompressis, sursum leviter attenuatis, basi subbulboso-incrassatis, raro aequalibus, flavidulis vel albidis, clavula pallidioribus, saepe basi fulvidulis, glabris vel farinosis, raro minute velutinis, usque ad 1 cm. crassis, cavis; ascis clavatis, breviter pedicellatis, apice attenuatis, non caerulescentibus, 85-125  $\times$  10-14  $\mu$ , octosporis; sporis parallele positae, acicularibus vel clavato-filiformibus, multiguttulatis dein multiseptatis, hyalinis, levibus, flexuosis, 35-70  $\times$  2-3  $\mu$ ; paraphysibus filiformibus, ramosis, apicibus curvatis vel uncinatis, non incrassatis.

Hab. ad terram vel humum in silvis, fere in silvis pinetis, aestate—autumno.

Typus in ?Herb. PERSOON.

Loc. typ.: ignotum.

Area distr.: Europa, America borealis, Sibiria, Asia orient. (Japonia).

Exempl. invest.:

Karafuto—Monte Kashipo (Y. TOKUNAGA, Sept. 9, 1929).

Hokkaido—Ishikari: Nopporo (S. IMAI, Oct. 10, 1926; Oct. 9, 1928; Oct. 8, 1930). Jōzankei (S. IMAI, Sept. 24, 1926); Monte Moiwa (Y. TOKUNAGA, Oct. 6, 1928). Iburi: Kutchan (K. YAMAKAWA, Sept. 6, 1932); Eniwa (H. ÔTANI, Sept. 6, 1933). Oshima: Ôno-mura (S. IMAI, Oct. 28, 1933; Sept. 21, 1935).

Honshû—Mutsu: Towadamura (S. IMAI, Sept. 25, 1935). Rikuchu: Omyōjin-mura (S. IMAI, Oct. 1, 1935). Shinano: Monte Kurohime (S. IMAI, Sept. 4, 1938); Azumi-mura (S. IMAI, Sept. 10, 1938).

The present fungus is one of the most common species in this family and it is widely variable in form and surface features, but it is easily distinguished from other species by the pale (yellow or yellowish) color of ascophore, as well as by the paler (yellowish or whitish) color of the stipe than that of the clavula.

According to DURAND's examinations of the types of the American species, *S. rugosa* PECK and *Mitrulopsis flavida* PECK, the two are nothing more than a rugose form and a depauperate form of this species respectively. In the material at hand, it is not rare to observe specimens which are nearly equivalent to these forms.

The measurements of the asci and spores given by various authors are as follows:

COOKE (1878)		spores 60 $\mu$ long.
KARSTEN (1871)	asci 100-130 $\times$ 12-16 $\mu$ ;	spores 45-70 $\times$ 2-3 $\mu$ .
PHILLIPS (1887)		spores 60-70 $\times$ 6-7 $\mu$ .
SACCARDO (1889)	asci 90-100 $\times$ 10-12 $\mu$ ;	spores 60-70 $\times$ 2-3 $\mu$ .
SCHROETER (1893)	asci 100-130 $\times$ 12-16 $\mu$ ;	spores 45-70 $\times$ 2-3 $\mu$ .
MASSE (1895)		spores 50-60 $\times$ 3.5-4 $\mu$ .
" (1897)	asci 100-140 $\times$ 12-15 $\mu$ ;	spores 50-65 $\times$ 3 $\mu$ .
REHM (1896)	asci 90-150 $\times$ 10-18 $\mu$ ;	spores 45-70 $\times$ 2-3 $\mu$ .
SEEVER (1904)		spores 50-60 $\times$ 2-3 $\mu$ .
DURAND (1908)	asci 100-125 $\times$ 12-14 $\mu$ ;	spores 35-65(40-50) $\times$ 2.5-3 $\mu$ .
LUIJK (1919)	asci 90-125 $\times$ 8.5-14 $\mu$ ;	spores 35-68 $\times$ 2-3 $\mu$ .
COKER (1927)	asci 60-135 $\times$ 9-13 $\mu$ ;	spores 40-48 $\times$ 2.9-3(1.8-2) $\mu$ .
BRESADOLA (1932)	asci 100-150 $\times$ 12-14 $\mu$ ;	spores 50-60 $\times$ 2-3 $\mu$ .
KOBAYASI (1939)	asci 100-125 $\times$ 12-13 $\mu$ ;	spores 50-75 $\times$ 2.5-3 $\mu$ .

For *Spathularia rugosa*:

PECK (1897)	asci 75-100 $\times$ 10-12 $\mu$ ;	spores 40-60 $\times$ 2 $\mu$ .
DURAND (1908)		spores 35-45(mostly 40-45) $\mu$ .

For *Mitrulopsis flavida*:

PECK (1903)	asci 120-160 $\mu$ long;	spores 60-80 $\times$ 2 $\mu$ .
DURAND (1908)		spores 55-65 $\mu$ long.

### *Spathularia velutipes* CKE. et FARLOW

*Spathularia velutipes* CKE. et FARLOW, Grevillea, XII, 37, 1883—FARLOW, Appalachia, III, 245, 1884—SACC. Syll. Fung. VIII, 60, 1889—MASS. Ann. Bot. XI, 256, t. 13, f. 85-88, 1897—BURT, Rhodora, I, 64, t. 4, f. 6, 1899—DURAND, Ann. Myc. VI, 443, t. 11, f. 101-102, t. 22, f. 221-222, 1908—MURRILL, Mycologia, VII, 299, 1915—OVERH. Mycologia, XIII, 28, 1921—COKER, Journ. Elisha Mitchell Sci. Soc. XLIII, 144, t. 20, 1927—WEHM. Canad. Journ. Research, XVIII, 540, 1940.

Nom. jap. *Koge-e-no-heratake*.

Ascomatibus solitariis, gregariis vel subcaespitosis, usque ad 6 cm.

longis, 1-3 cm. latis, spathulatis; clavulis lateraliter compressissimis, flavidulis, flavis vel brunneolo-flavis, ad positus oppositos stipitis decurrentibus, margine rotundatis, levibus vel undulatis, incisus vel lobatis, interdum contortis; stipitibus subteretis vel compressis, sursum late expansis et complanatis, 2-4 cm. altis, sursum usque ad 1.5 cm. latis, basi 3-5 mm. crassis, solidis, badiis, adulto longitudinaliter rugulosis, minute velutinis vel sublevibus; ascis clavatis, apice attenuatis, poro iodo non caerulescentibus, 80-100-120  $\times$  7.5-10  $\mu$ , octosporis; sporis parallele positis, hyalinis, levibus, acicularibus vel clavato-filiformibus, rectis vel curvatis, demum multiseptatis, (33-)37-(44)-60  $\times$  2-2.5(-3)  $\mu$ ; paraphysibus filiformibus, hyalinis, ramosis, sursum circinatis vel uncinatis.

Hab. ad truncos putridos vel humum in silvis, fere in silvis pinetis vel mixtis, aestate-autumno.

Typus in Herb. Kew, Anglia.

Local. typ.: Shelburne, New Hampshire, Amer. bor.

Area distr.: America borealis, Asia orient. (Japonia).

Exempl. invest.:

Honshû—Kai: Nishinoumi-mura (S. IMAI, Oct. 4, 1940). Kaga: Monte Hakusan (S. AKAI, Aug. 8, 1931, in Herb. HEMMI, Univ. Imp. Kyoto).

Shikoku—Tosa: Taishô-mura (S. IMAI, Oct. 4, 1939).

The present fungus is easily distinguished from *S. flavida* by the stipe which is darker color (bay brown) than the clavula (yellow or yellowish) and when matured much more rugose than that of the latter species. The velvety appearance of the surface of stipe is also claimed as an essential taxonomic criterion for this fungus. That, however, seems to be a less important character than those above mentioned, because it is often observed on the specimens of the typical *S. flavida*.

The measurements of asci and spores for this species given by the authors are as follows:

COOKE (1883)		spores 0.06 mm. long.
SACCARDO (1889)		spores 60 $\mu$ long.
MASSEE (1897)	asci 85-100 $\times$ 10-11 $\mu$ ;	spores 55-60 $\times$ 1.5 $\mu$ .
BURT (1899)		spores 55-60 $\times$ 1.5 $\mu$ .
DURAND (1908)	asci 80-105 $\times$ 10 $\mu$ ;	spores 33-43(35-40) $\times$ 2 $\mu$ .
COKER (1927)	asci 92-111 $\times$ 11 $\mu$ ;	spores 37-44 $\times$ 2.7-3 $\mu$ .

DURAND said "COOKE, MASSEE and others give the measurements of the spores as 55-60  $\mu$  long, but I have not succeeded in finding one more than 43  $\mu$  long and the majority are less than this".

The Japanese fungus is quite identical with the fungus described and illustrated by DURAND and COKER in the macroscopic features, but the asci and spores are longer (37-60  $\mu$ , mostly 50-60  $\mu$ ) than those of these authors. The writer, however, observed that the asci are 90-100  $\times$  8-9  $\mu$  and the spores 37.5-50  $\times$  2  $\mu$  in the American specimens of this species which were collected by J. A. STEVENSON at Laing Trail, Near Mountain Lake, Va., Sept. 3, 1936 and so determined by E. K. CASH.

No ideal free spores were observed on other American specimens at hand: FARLOW, Shelburne, N. H., 1885; K. MIYABE, Shelburne, N. H., July, 1887; E. A. BURT, Floodwood, N. Y., Aug. 17, 1900; H. R. LOTTON, Haywood County, N. C., Aug. 2, 1926. The asci in the FARLOW specimen were 100-125  $\times$  8-10  $\mu$ .

Regarding the identity of *S. velutipes* and *S. rufa*, there seems to be much discussion.

DURAND considered that the present species is closely allied to *S. rufa* SWARTZ (non NEES) but is distinguished from the latter by the much smaller asci and spores. He, however, has not given the measurements of those of *S. rufa* which he studied himself.

For *S. rufa*, the following measurements of asci and spores have been given:

REHM (1896) asci 100  $\times$  15  $\mu$ ; spores 50-70  $\times$  2  $\mu$ .

MASSEE (1897) asci 100-130  $\times$  10-12  $\mu$ ; spores 60-70  $\times$  2  $\mu$ .

LLOYD included the present species as a synonym of *S. rufa*, without any referable data, but only referring to some literatures.

It seems to the present writer that *Spathularia rufa* itself has not yet been fixed for its referable characters, because, as far as the writer is aware, the most referable literatures are of COOKE, GILLET, SACCARDO, REHM and MASSEE, all of which were mainly based upon RABENHORST's Fungi Europaei Exsiccati, No. 235 (1861), which was later named *Spathularia rufa* RAB. by COOKE and GILLET, and *S. rufa* var. *lilacina* by QUÉLET.

As far as this RABENHORST's Exsiccatum is concerned, the species is evidently different from *S. velutipes*, even in the macroscopic features.

In Europe, especially in the northern countries, there is a species differing from *S. flavida*, as has been mentioned in the writer's previous paper. For example, the fungus which was collected by I. JØRSTAD from Singsås, Norway on August 21, 1927 is evidently distinct from *S. flavida* in the dried state, and has the following characters: The ascophores are 1.5-3 cm. long, and spathulate. The clavula is obovate, even or slightly waved in outline, orange cinnamon or mikado-brown. The stipe is 1-3 mm.

wide, attenuated upward, subglabrous, sayal-brown or snuff-brown. The asci are clavate-cylindrical or subcylindrical,  $65.5-82.5 \times 7.5-10 \mu$ . The spores are clavate-filiform or filiform,  $32.5-42.5 \times 2 \mu$ . The general appearance in dried state is very closely similar to that of *S. velutipes* from which *S. rufa* of RABENHORST is clearly distinct.

Whether this Norwegian *Spathularia* is the same as *S. velutipes* or as *S. rufa* of SWARTZ or distinct from these species, the writer can not accurately determine at the present.

At any rate, the identity and distribution of *S. velutipes*, which has now been reported from eastern North America and Japan, with special reference to *S. rufa* of northern Europe, should be an interesting subject for future study.

#### Trib. **Geoglosseae** IMAI, emend.

*Phaeoglosseae* S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 144, 1932, nom. seminud., pro maj. parte.

**Geoglosseae** (non CORDA, nec SACC. nec REHM, nec DURAND) IMAI, Ann. Myc. XXXVIII, 272, 1940, pro maj. parte.

Ascomia clavatum vel subcapitatum, atrum vel brunneo-atrum. Sporae cylindratae vel clavato-cylindratae et multiseptatae, vel ovatae et continuatae, fuligineae; cetera ut in Subfamilia.

Typus: *Geoglossum* PERS. ex FR.

The taxonomy of the tribe Geoglosseae as it stands at present was founded by BOUDIER and DURAND, especially that of the species by the latter author.

In 1885, BOUDIER separated the genus *Trichoglossum* from the old genus *Geoglossum*, and DURAND, in 1908, established *Gloeoglossum* separating it from *Geoglossum* sensu BOUDIER.

In 1922, PETCH published a genus *Phaeoglossum*, from Ceylon, characterizing it by "Clava stalked, expanding above into an ovoid or subhemispherical head, which bears a continuous palisade layer of asci and paraphyses. Asci furnished with a pore. Spores continuous, oval, fuscous." The type species is *Phaeoglossum zeylanicum* PETCH.

#### **Geoglossum** PERS. ex FR. emend. DURAND.

*Geoglossum* pro parte PERS. in ROEMER N. Mag. Bot. I, 116, 1794 (sec. DURAND); Obs.

Myc. I, 11, 1796; Conn. Fung. Clav. 36, 1797; Syn. Fung. 607, 1801; Myc. Eur. I, 193, 1822.

*Geoglossum* pro parte FR. Syst. Myc. I, 487, 1821; Syst. Orb. Veg. I, 89, 1825; Epicr. Myc. 582, 1838; Summa Veg. Scand. 347, 1849—BERK. in SMITH Engl. Fl. V, 2, 178, 1836; Outl. Brit. Fung. 361, 1860—BONORD. Handb. Allgem. Myk. 206 & 299, 1851—KICKX, Fl. Crypt. Flandr. I, 500, 1867—CKE. Handb. Brit. Fung. 662, 1871; Mycogr. I, 1, 1875; Handb. Austr. Fung. 251, 1892—KARST. Myc. Fenn. I, 7, 1871—QUÉL. Champ. Jura Vosg. II, in Mém. Soc. D'Emul. Montb. 2 sér. V, 384, 1873; Ench. Fung. 265, 1886—GILL. Disc. Fr. 24, 1879—SACC. Bot. Centralbl. XVIII, 214, 1884—PHILLIPS, Brit. Disc. 34, 1887—MASS. Brit. Fung. Fl. IV, 489, 1895; Ann. Bot. XI, 240, 1897—LLOYD, Geoglossaceae, 5, 1916.

*Geoglossum* BOUD. Bull. Soc. Myc. Fr. I, 110, 1885, pro parte; Hist. Class. Disc. Eur. 86, 1907, pro parte,

*Geoglossum* Subg. *Eugeoglossum* SACC. Syll. Fung. VIII, 42, 1889, pro parte—SCHROET. Pilze Schles. II, 18, 1893, pro parte; in ENGLER & PR. Nat. Pfl. Fam. I, 1, 165, 1894, pro parte—REHM, Pilze Deut., Hyst. & Disc. 1153, 1896, pro parte—UNDERW. Mnn. Bot. Stud. I, 484, 1896, pro parte.

***Geoglossum*** DURAND (sensu strict.) Ann. Myc. VI, 423, 1908—LUIJK, Kruidk. Arch. Jaarg. 1918, 130, 1919—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 146, 1932—IMAI, Ann. Myc. XXXVIII, 269 & 275, 1940.

Ascoma carnosum, rectum, stipitatum, fere clavatum, sursum ascigerens, atrum vel brunneo-atrum. Asci clavato-cylindracei, inoperculati, octospori vel 4-6-spori; sporae cylindraceae vel clavato-cylindraceae, 3-15-septatae, fuligineae, parallele positae vel multiseriatae; paraphyses filiformes, septatae, vulgo sursum brunneae, solum clavulam tegentes.

Typus: *Geoglossum glabrum* PERS. ex FR.

The present genus is characterized principally by the clavate black ascophore, not viscid nor velvety but fleshy, the clavate, clavato-cylindrical or cylindrical dark spores, and the fact that the paraphyses do not form a thick coating over the stipe.

#### Clavis specierum.

##### I. Sporae demum 7-septatae.

- A. Paraphyses in 2-4-cellulis apicibus moniliformae septatae, quarum cella extrema globosa vel subglobosa et magna ..... *G. glabrum*.
- B. Paraphyses in multicellulis apicibus moniliformae septatae, quarum cellae oblongae vel ellipsoideae ..... *G. simile*.
- C. Paraphyses in 2-5-cellulis apicibus irregulariter moniliformae septatae et vulgo valde curvatae vel circinatae, quarum cellae irregulares ..... *G. japonicum*.

- D. Paraphyses in cella apicis clavatae, non moniliformes ..... *G. nigratum*.
- II. Sporae 7-15-septatae.
- A. Ascoma vulgo clavatum.
1. Paraphyses apicibus cum ascis cohaerentibus epithecium brunneum non vel vix leviter formantes.
- a. Sporae vulgo 7-12-septatae, longe hyalinae; paraphyses subhyalinae vel pallide fuligineae; ascoma fulvum vel umbrinum ..... *G. fallax*.
- b. Sporae vulgo 7-12-septatae, potium aetate fuliginosae; paraphyses fuligineae, apicibus cum ascis cohaerentibus epithecium brunneum leviter formantes; ascoma nigricans ..... *G. fallax* var. *proximum*.
- c. Sporae vulgo 7-14-septatae, raro usque ad 15-septatae; paraphyses pallide brunneae; ascoma atrum ..... *G. fallax* var. *subpumilum*.
2. Paraphyses apicibus cum ascis cohaerentibus epithecium brunneum formantes; sporae demum 15-septatae, longe hyalinae ..... *G. alveolatum*.
- B. Ascoma parum, capitatum; sporae demum 15-septatae, fere cylindratae ..... *G. pumilum*.

### *Geoglossum glabrum* PERS. ex FR.

?*Clavaria ophioglossoides* LINN. Sp. Pl. 1182, 1753—GMEL. in LINN. Syst. Nat. II, 1443, 1791.

*Geoglossum glabrum* PERS. in ROEMER N. Mag. Bot. I, 116, 1794 (sec. DURAND); Comm. Fung. Clav. 36, 1797; Obs. Myc. II, 61, 1799; Syn. Fung. 608, 1801.

*Geoglossum sphagnophilum* EHRB. Sylv. Myc. Ber. 30, 1818—PERS. Myc. Eur. I, 195, 1822—SACC. Syll. Fung. VIII, 44, 1889.

*Geoglossum glabrum* FR. Syst. Myc. I, 488, 1821, pro parte; Epicr. Myc. 582, 1838; Summa Veg. Scand. 347, 1849—PERS. Myc. Eur. I, 194, 1822, excl. var.—BERK. in SMITH Engl. Fl. V, 2, 178, 1836; Outl. Brit. Fung. 362, 1860—KICKX, Fl. Crypt. Flandr. I, 500, 1867—FUCK. Symb. Myc. 333, 1869—CKE. Handb. Brit. Fung. 663, 1871; Mycogr. I, 7, t. 3, f. 9, 1875; Handb. Austr. Fung. 251, 1892—QUÉL. Champ. Jura Vosg. II, in Mém. Soc. D'Emul. Montb. 2 sér. V, 284, 1873; Ench. Fung. 266, 1886—GILL. Disc. Fr. 25, cum fig. 1879—PHILLIPS, Brit. Disc. 36, 1887—ROZE, Bull. Soc. Myc. Fr. VI, xxx, 1890—ARNOULD, Bull. Soc. Myc. Fr. IX, 112, 1893—BOUD. Bull. Soc. Myc. Fr. XI, xxvi, 1895—MASS. Brit. Fung. Fl. IV, 491, 1895; Ann. Bot. XI, 246, t. 12, f. 44-46 (p. p.), 1897—DURAND, Ann. Myc. VI, 425 (p. p.), t. 7, f. 50-52, 55, t. 12, f. 124-129, 1908—L. MAIRE, Bull. Soc. Myc. Fr. XXVI, 264, 1910—LIND, Dan. Fung. 89, 1913—LUIJK, Kruidk. Arch. Jaarg. 1918, 130, f. 7, 1919; Meded. Rijks Herb. Leiden, No. 39, 3, f. 5, 1919—MOREAU, Bull. Soc. Myc. Fr. XLIV, 74 et 78, 1928—KAWAMURA, Jap. Fung. no. 83, 1929—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932—IMAI, Ann. Myc. XXXVIII, 276, 1940.

*Geoglossum glabrum* \* *Sphagnophilum* FR. Epicr. Myc. 583, 1838.

*Geoglossum ophioglossoides* SACC. Syll. Fung. VIII, 43, 1889—SCHROET. Pilze Schles. II, 19, 1893; in ENGLER & PR. Nat. Pl. Fam. I, 1, 165, 1894—REHM, Pilze Deut., Hyst. & Disc. 1155, 1896—PAT. Bull. Soc. Myc. Fr. XIV, 196, 1898—HARIOT & PAT. Journ. Bot. XVII, 15, 1903—KILLERM. Krypt. Forsch. No. 3, 149, 1918—LARSEN, Bot. Iceland, II, 507, 1932.

*Geoglossum ophioglossoides* var. *sphagnophilum* REHM, Pilze Deut., Hyst. & Disc. 1156, 1896.

Nom. jap. *Tama-tengu-no-meshigai*.

Ascomatibus solitariis, gregariis vel subcaespitosis, clavatis, 3-9 cm. longis, atris; clavulis 1-3 cm. longis, circa  $\frac{1}{3}$  ascomatae loculis, usque ad 1 cm. latis, lanceolatis, compressis, obtusis vel acutis, vix vel leviter delimitatis; stipitibus teretibus vel leviter compressis, brunneo-atris vel atris, dense squamulosis, usque ad 5 mm. crassis; ascis clavato-lanceolatis vel clavato-cylindraceis, apice rotundatis sed contractis, poro iodo caerulescentibus, brevi stipitatis, 150-225 × 15-25  $\mu$ , octosporis; sporis parallele positis, clavatis, obscure fuliginis, 7-septatis, vulgo leviter curvatis, 60-105 × 7-10  $\mu$ ; paraphysibus ascis leviter longioribus, inferne filiformibus ca. 3  $\mu$  crassis, superne in 2-4-cellulis apicibus moniliformae septatis brunneolisque, rectis vel curvatis, cellulis apicibus 5-9  $\mu$  crassis.

Hab. in *Sphagnetis*, vel ad humum, aestate—autumno.

Typus in Herb. PERSOON, in Rijks Herb., Leiden.

Loc. typ.: ignotum.

Area distr.: Europa, Asia orient. (Japonia), ? Asia trop. (India, Java), ? America bor. et austr., ? Australia.

Exempl. invest.:

Hokkaido—Kushiro: Akan (K. MIYABE, Aug. 1920). Ishikari: Tsu-  
ishikari (S. ITO, Sept. 13, 1913).

The present fungus has been considered one of the most common and widely distributed species in the world, however, it seems to be less distributed and rather more uncommon than the records would indicate. The writer considers that the present fungus may also be distributed in North America, but that is not certain at present.

As to the habitat of this fungus, it has been recorded by many as on mosses, humus, ground and rotten wood, but as far as the writer's material is concerned, it occurs only on mosses. NANNFELDT has also recognised the same fact on the European material.

The present fungus is characterized by black or brownish-black, compressed ascophores which are not viscid, and by the clavate, stout, 7-septate spores, as well as by the closely septate paraphyses commonly

moniliformed in the globose or subglobose apical 2-4 cells, by which it is easily distinguished from *G. simile* PK., *G. japonicum* IMAI, and *G. nigratum* (FR.) CKE.

According to DURAND, who examined the type or authentic specimens in the PERSEON Herbarium, *Geoglossum glabrum*, *G. glabrum a vulgare*, *G. laevipes* PERS. and *G. sphagnophilum* EHRB. agree with one another in essential characters and represent a single species. According to DURAND, *G. difforme* of COOKE is also identical with this, it, however, is treated by NANNFELDT as a distinct species and is named *G. Cookeianum* NANNF.

*Clavaria ophioglossoides* L. had been included as a synonym of this by PERSEON, FRIES and others, but the description is too brief accurately to identify it at the present.

The measurements of the asci and spores given by different authors are as follows:

FUCKEL (1869)	spores $84 \times 7 \mu$ , 3-4-septate.
PHILLIPS (1887)	spores $85-90 \mu$ long, 7-septate.
SACCARDO (1889)	spores $70-80 \times 7-9 \mu$ , 7-septate.
SCHROETER (1893)	asci $100-120 \times 12-15 \mu$ ; spores $55-80 \times 5-7 \mu$ , 7-septate.
REHM (1896)	asci $150-200 \times 20-24 \mu$ ; spores $60-90 \times 5-7 \mu$ , 7-septate.
MASSEE (1897)	asci $165-210 \times 18-20 \mu$ ; spores $75-85 \times 8-9 \mu$ , 7-septate.
LUIJK (1919)	asci $120-230(145-185) \times 17-28 \mu$ ; spores $55-95 \times 5-8 \mu$ , 7-septate.

### *Geoglossum simile* PK.

*Geoglossum simile* PK. Bull. Buff. Soc. Nat. Sci. I, 70, 1873; 25 Ann. Rep. N. Y. State Mus. 97, 1873.

*Geoglossum glabrum* (non PERS. nec FR.) PK. 29 Ann. Rep. N. Y. State Mus. 54, 1878.

*Geoglossum glabrum* DURAND, Ann. Myc. VI, 425 (pro parte), t. 7, f. 53-54, t. 12, f. 121-123, 1908.

*Geoglossum glabrum* plur. auct. Amer. bor., pro parte.

Nom. jap. *Juzu-tengu-no-meshigai*.

Ascomatibus solitariis, gregariis vel subcaespitosis, clavatis, 3-7 cm. longis, atro-brunneis vel atris; clavulis 1-3 cm. longis, circa  $\frac{1}{3}$  ascomatae loculis, 3-8 mm. latis, lanceolatis, compressis, obtusis vel acutis, non vel vix delimitatis; stipitibus teretibus vel leviter compressis, atro-brunneis, dense squamulosis vel furfuraceis, 1.5-5 mm. crassis; ascis clavato-lanceolatis vel clavato-cylindraceis, apice contractis sed rotundatis, poro iodo caerulescen-

tibus, breve stipitatis,  $170-200 \times 20-22 \mu$ , octosporis; sporis parallele positis, clavato-cylindraccis vel subclavatis, vulgo leviter curvatis, obscure fuligineis, 7-septatis, rarissimo minus septatis,  $65-110 \times 7-8 \mu$  (majoribus  $75-100 \mu$ ); paraphysibus ascis longioribus, infra filiformibus subhyalinis circa  $3-4 \mu$  crassis, supra pallide fuligineis rectis vel flexuosis vel curvatis, in multicellulis apicibus ellipsoideae vel oblongae vel brevi-cylindraccae septatis, cellulis  $5.5-6.5 \mu$  crassis, cellis apicibus saepe usque ad  $8 \mu$  crassis.

Hab. ad truncos putridos vel in humum, aestate—autumno.

Typus in Herb. New York State Mus., Albany, N. Y., Amer. bor.

Loc. typ.: Sandlake, N. Y., Amer. bor.

Area distr.: America borealis, Asia orient. (Japonia).

Exempl. invest.:

Honshû—Shimotsuke: Oku-Nikkô (S. IMAI, Oct. 7, 1937).

The present fungus has been considered identical with *G. glabrum* PERS. since the author, PECK, treated it so in 1878. However, it is easily distinguished from the latter species by the narrower spores, as well as by the paraphyses. The latter are closely septated into many ellipsoidal, oblong or short cylindrical cells which give rise to chains of barrel-shaped links, and which often have a median septum resembling the didymospores.

From *Geoglossum japonicum* IMAI, it is also easily distinguished by its characteristic paraphyses.

It is said to occur on very rotten wood, rich humus and in *Sphagnum*-bogs in North America, but the material at hand was found on very rotten wood.

It seems to have been known only from North America, and now from Japan, but not from Europe.

### ***Geoglossum japonicum* IMAI, sp. nov.**

Nom. jap. *Yamato-tengu-no-meshigai*.

Ascomatibus gregariis, subcaespitosis vel solitariis, clavatis, 3-8 cm. longis, brunneo-atris vel atris; clavulis 1-3 cm. longis, circa  $\frac{1}{3}$  ascomatae loculis, usque ad 1 cm. latis, lanceolatis, compressis, obtusis vel acutis, vix vel leviter delimitatis; stipitibus teretibus vel leviter compressis, brunneo-atris vel atris, leviter squamulosis, usque ad 5 mm. crassis; ascis clavato-lanceolatis vel clavato-cylindraccis, apice rotundatis sed contractis, poro iodo caerulescentibus, stipitatis,  $180-210 \times 15-22.5 \mu$ , octosporis; sporis parallele positis, clavato-cylindraccis, obscure fuligineis, 7-septatis, vulgo leviter cur-

vatis, 60–97.5 × 6–8  $\mu$ ; paraphysibus ascis longioribus, inferne filiformibus, subhyalinis ca. 3  $\mu$  crassis, apicibus pallide brunneis in 2–5 cellulis apicibus irregulariter moniliformae septatis, vulgo irregulariter valdeque curvatis vel circinatis, raro vix rectis.

Hab. ad terram in silvis, aestate—autumno.

Typus in Herb. IMAI, Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Nakano-shima Tô-ya-lacus, Prov. Iburi, Hokkaido, Japonia.

Area distr.: Japonia.

Exempl. invest.:

Hokkaido—Ishikari: Nopporo (S. IMAI, Oct. 11, 1931; Sept. 18, 1932).

Iburi: Tôya, Nakano-shima (G. HAYASHI, Sept. 27, 1932); Shikotsu (S. IMAI, Sept. 9, 10, 1935).

The present fungus is closely allied to *G. glabrum* with which the writer formerly considered it identical. However, it is clearly distinguished from the latter species by the narrower spores, as well as by the more irregularly moniliformed paraphyses which are strongly curved or circinate at the apex.

This is also closely allied to *G. Cookeianum* NANNF. of a European species, from which it is distinguishable by the more irregular and more bullate cells at the apical moniliform part of the paraphyses which are more irregularly and strongly curved or circinate.

### *Geoglossum nigratum* (FR.) CKE.

*Clavaria nigrita* FR. Hym. Eur. 676, 1874.

*Geoglossum nigratum* CKE. Mycogr. I, 205, t. 96, f. 345, 1878; Handb. Austr. Fung. 252, 1892—SACC. Syll. Fung. VIII, 44, 1889—REHM, Pilze Deut., Hyst. & Disc. 1157, 1896—UNDERW. Minn. Bot. Stud. I, 494, 1896—DURAND, Ann. Myc. VI, 427, t. 7, f. 57–59, t. 12, f. 130–132, 1908—LLOYD, Geoglossaceae, 10, 1916—KAUFFM. Mycologia, IX, 160, 1917—SEEVER, Mycologia, XVII, 49, 1925—SEEVER & CHARDON, Sci. Surv. Porto Rico & Virg. Isl. VIII, 73, 1926—HEMMI & KURATA, Fungi, I, 88, f. 3, 1931—S. ITO & IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932—TENG, Contr. Biol. Lab. Sci. Soc. China, VIII, 52, & 89, 1932—CLEL. Toads. & Mushr. 342, 1935—POVAH, Papers Mich. Acad. Sci. XX, 132, 1935—IMAI, Ann. Myc. XXXVIII, 276, 1940—WEHM. Canad. Journ. Research, XVIII, 540, 1940.

*Geoglossum glabrum* f. *difforme* MASS. Ann. Bot. XI, 248, 1897, pro parte.

*Geoglossum difforme* (non FR. nec CKE.) Auct. pro parte.

Nom. jap. *Hime-tengu-no-meshigai*.

Ascomatibus solitariis, gregariis vel subfasciculatis, clavatis, atris vel

brunneo-atris, 1.5–6–8 cm. longis; clavulis longe ellipsoideis vel lanceolatis, compressis vel longitudinaliter lacunosis, apice subacutis,  $\frac{1}{3}$ – $\frac{1}{2}$  ascomatae loculis, 2–6 mm. latis; stipitibus teretis, gracilibus, 0.5–2 mm. crassis, longitudinaliter rugulosis, furfuraceis, minute squamulosis vel fere levibus; ascis clavatis, cylindraceo-clavatis vel clavato-lanceolatis, apice rotundatis sed contractis, poro iodo leviter caerulescentibus,  $150$ – $182 \times 16$ – $18 \mu$ , octosporis; sporis parallele positis, cylindraceis vel cylindraceo-clavatis, fuligineis, typice 7-septatis,  $54$ – $97.5 \times 5$ – $6 \mu$ ; paraphysibus filiformibus, ascis longioribus, septatis, sursum non moniliformibus, sursum 1–3-cellulis incrassatis, in cella apicis clavatis, vulgo plus minusve curvatis.

Hab. ad terram udam vel humum, raro ad truncos putridos, aestate–autumno.

Typus in Herb. Kew, Anglia.

Loc. typ.: prope Upsaliam.

Area distr.: Europa, America bor., Australia, Asia orient. (Japonia, Sina).

Exempl. invest.:

Hokkaido—Kushiro: Akan (S. IMAI, Sept. 15, 16, 1933; Sept. 23, 1934). Ishikari: Nopporo (S. IMAI, Sept. 18, 25, Oct. 7, 1927; Sept. 19, Oct. 8, 17, 1930; Oct. 11, 1931; Oct. 2, 1932; Aug. 18, 1935); Sōunkyo (S. IMAI, Sept. 13, 1939). Ihuri: Shikotsu (S. IMAI, Sept. 19, 1931).

Honshū—Musashi: Monte Takao (Y. KOBAYASI, Oct. 4, 1936; S. IMAI, Oct. 15, 1940). Shinano: Azumi-mura (S. IMAI, Sept. 10, 12, 1938). Hida: Yamanokuchi-mura (S. IMAI, Sept. 17, 1938). Kii: Tanabe (K. MINAKATA, Apr. 10, 1907, ex Herb. MINAKATA). Yamashiro: Kyoto (T. HEMMI, Jul. 24, 1931, in Herb. HEMMI, in Univ. Imp. Kyoto).

The fungus is closely allied to *G. glabrum* from which it is easily distinguished by the smoother stipe, smaller asci and spores, as well as by the remotely septated paraphyses which are slender and thickened only in the terminal cell.

The measurements of the asci and spores given by various authors as follows:

COOKE (1878)		spores $0.07 \times 0.005$ mm., 7-septate.
" (1892)		spores $70 \times 5 \mu$ , 7-septate.
REHM (1896)	asci $130 \times 25 \mu$ ;	spores $70 \times 5 \mu$ , 7-septate.
DURAND (1908)	asci $150$ – $175 \times 18 \mu$ ;	spores $54$ – $85 \times 6 \mu$ , 7-septate.
HEMMI (1931)	asci $153.5$ – $185.6 \times 16$ – $19.2 \mu$ ;	spores $73.5$ – $94.5 \times 4.5$ – $6.4 \mu$ , 7-septate.

CLELAND (1935) asci  $260 \times 15 \mu$ ; spores  $45-48 \times 4-4.5 \mu$ , 7-septate.

***Geoglossum fallax* DURAND**

*Geoglossum glabrum*  $\beta$  *paludosum* PERS. Myc. Eur. I, 194, 1822 (teste DURAND).

*Geoglossum rugosum* LASCH in KLOTSZ. Herb. Viv. Myc. no. 816, sine diag. (teste LUIJK).

***Geoglossum fallax* DURAND**, Ann. Myc. VI, 428, t. 7, f. 61-64, t. 13, f. 133-137, 1908—SACC. Syll. Fung. XXII, 604, 1913—KAUFFM. Mycologia, IX, 160, 1917—LUIJK, Kruidk. Arch. Jaarg. 1918, 133, f. 8, 1919, Meded. Rijks Herb. Leiden, No. 39, 5, f. 3, 6, 7, 9, 1919—TENG, Contr. Biol. Lab. Sci. Soc. China, VIII, 52, 1932—KOBAYASI, Nippon Inkwas. Dukan, 307, t. 144, f. 1-2, 1939—IMAI, Ann. Myc. XXXVIII, 276, 1940—WEHM. Canad. Journ. Research, XVIII, 540, 1940.

*Geoglossum paludosum* DURAND, Ibid. VI, 429, 1908, pro synonym.—LLOYD, Geoglossaceae, II, f. 792, 1916.

Nom. jap. *Kabairo-tengunomeshigai*.

Ascomatibus solitariis vel gregariis, clavatis, fulvis vel umbrinis, siccate nigrescentibus, 2-8.5 cm. longis; clavulis lanceolatis vel longe ellipsoideis, obtusis, compressis, 8-15 mm. longis, 3-5 mm. crassis,  $\frac{1}{3}$ - $\frac{1}{2}$  ascomatae loculis; stipitibus gracilibus, teretibus, sursum squamulosis et leviter incrassatis, deorsum 1-2 mm. crassis; ascis cylindraneo-clavatis, apice contractis, poro iodo caerulescentibus,  $150-250 \times 17.5-20 \mu$ , octosporis; sporis distichis vel multiseriatis, cylindraneo-clavatis, rectis vel curvatis, primo continuis multiguttulatisque, dein 3-, demum 7-12-septatis,  $62-105 \times 5-7 \mu$ , longe hyalinis, demum fuliginosis; paraphysibus ascis longioribus, inferne filiformibus hyalinisque, sursum subhyalinis vel pallide fuliginosis, curvatis vel circinatis, apicibus abrupte ellipsoideis vel globosis.

Hab. ad terram argillaceam in silvis, aestate—autumno.

Typus in Herb. Univ. Cornell, Ithaca, N. Y., Amer. bor.

Loc. typ.: Coy Glen, Ithaca, N. Y., Amer. bor.

Area distr: America borealis, Asia orient. (Japonica, Sina).

Exempl. invest.:

Hokkaido—Ishikari: Nopporo (S. IMAI, Oct. 2, 1932).

Honshû—Sagami: Enoshima (R. IMAZEKI, Mai. 29, 1932, in Herb. Tokyo Sci. Mus.). Musashi: Monte Takao (Y. KOBAYASI, Jun. 13, 1937).

The present species is characterized by the dark brown or tawny-brown ascophore and by the spores remaining for a long time hyaline, so that in some preparations only a few colored and normally septate ones can be



ascis longioribus, inferne filiformibus, subhyalinis, sursum clavatis fuliginisque, apicibus abrupte ellipsoideis vel globosis, ca.  $6\ \mu$  crassis, cum ascis cohaerentibus epithecium brunneum leviter formantibus.

Hab. ad terram, aestate.

Typus in Herb. IMAI, Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Wakayama, Prov. Kii, Honshû, Japonia.

Area distr.: Japonia.

Exempl. invest.:

Honshû—Kii: Wakayama (K. MINAKATA, Apr. 3, 1902, ex Herb. MINAKATA).

The present fungus is distinguished from the species, *G. fallax*, by the spores being colored in rather early stage, as well as by the darker colored paraphyses which form a brownish epithecium though it is slight.

***G. fallax* var. *subpumilum* (IMAI) IMAI, comb. nov.**

*Geoglossum subpumilum* IMAI, in S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932, nom. nud.—IMAI, Trans. Sapporo Nat. Hist. Soc. XIII, 179, t. 7, f. 3-5, 1934.

Nom. jap. *Yezo-tengunomeshigai*.

Ascomatibus clavatis, adulto atris; ascis clavatis vel clavato-cylindraceis, apice contractis, poro iodo caerulescentibus, octosporis,  $150-210 \times 20-27.5\ \mu$ ; sporis fasciculatis, cylindraco-clavatis vel subcylindracois, primo continuis multiguttulatisque, demum 7-14-septatis, raro usque ad 15-septatis,  $62.5-117.5 \times 6-7.5\ \mu$  (plurima  $80-100\ \mu$ ), demum fuliginis; paraphysibus inferne filiformibus subhyalinis, sursum pallide brunneis, rectis vel curvatis, apicibus abrupte ellipsoideis vel globosis,  $7.5-10\ \mu$  crassis.

Hab. in terra silvarum, autumno.

Typus in Herb. IMAI, Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Nopporo, Prov. Ishikari, Hokkaido, Japonia.

Area distr.: Japonia.

Exempl. invest.:

Hokkaido—Ishikari: Nopporo (S. IMAI, Oct. 7, Nov. 9, 1930).

The present fungus was formerly treated as a species distinct from *G. fallax*, but is now considered a variety of the latter, from which it is distinguished by the rather early colored spores with many septations, containing, though rarely, a 15-septate one.

From *Geoglossum pumilum* WINT. having 15-septate spores, it is easily distinguished by the form of ascophore.

***Geoglossum alveolatum* (REHM) DURAND**

*Leptoglossum alveolatum* REHM, Ann. Myc. II, 32, 1904—SACC. Syll. Fung. XVIII, 8, 1906.

*Geoglossum alveolatum* DURAND, Ann. Myc. VI, 432, t. 8, f. 68-69, t. 14, f. 145-148, 1908—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932.

Nom. jap. *Shiro-mi-no-tengunomeshigai*.

Ascomatibus gregariis vel solitariis, clavatis, 1.5-5 cm. longis; clavulis lanceolatis, fusiformibus vel oblongis, obtusis, compressis, non-numquam rugosis, atris, leviter distinctis, 0.4-2.2 cm. longis, 4-8 mm. latis,  $\frac{1}{8}$ - $\frac{1}{2}$  ascomatae loculis; hymenio uvido levi exsiccato saepe alveolato; stipitibus gracilibus, teretis, aequalibus vel sursum leviter incrassatis, atris, distincte squamulosis vel subhirsutis, 1-2.5 cm. longis, 1-2 mm. crassis, pilis brunneis, flexuosis, septatis obsessis; ascis cylindraceo-clavatis, apice rotundatis sed leviter contractis, poro iodo caerulescentibus, 160-190 × 15-17.5  $\mu$ , octo-sporis; sporis parallele positis vel multiseriatis, anguste cylindraceis, cylindraceis deorsumque angustis, rectis vel curvatis, utrimque obtusis, primo continuis, dein 7-, demum 15-septatis, longe hyalinis, demum pallide brunneis, 50-105 × 5  $\mu$ ; paraphysibus ascis longioribus, inferne filiformibus, 3  $\mu$  crassis, pallidis, sursum olivaceo-brunneolis, apicibus ellipsoideis vel globosis, 5-8  $\mu$  crassis, cum ascis cohaerentibus epithecium olivaceo-brunneum formantibus.

Hab. ad truncos putridos in silvis, aestate—autumno.

Typus in Herb. REHM.

Loc. typ.: Tichenor's Glen, Canandaigua, N. Y., Amer. bor.

Area distr.: America bor., Asia orient. (Japonia).

Exempl. invest.:

Hokkaido—Kitami: Notoro (S. IMAI, Sept. 19, 1927). Kushiro: Akan (S. IMAI, Sept. 12, 1927; Sept. 15, 16, 1933). Ishikari: Nopporo (S. IMAI, Oct. 2, 1932); Monte Soranuma (S. IMAI, Sept. 18, 1930).

Honshû—Suruga: Ikawamura (D. HIRANUMA, Jul. 23, 1923, ex Herb. MINAKATA).

The spores remain hyaline for so long a time that the fungus may be mistaken for a member of the dark colored group (*Melanoglossum*) of *Microglossum*.

The measurements of the asci and spores were given by REHM and DURAND as follows, respectively:

Asci 100-150 × 14-15  $\mu$ ; spores 60-65 × 4-5  $\mu$ , 7-13-septate.

Asci 150-170 × 15  $\mu$ ; spores 60-95 × 4-5  $\mu$ , 7-15-septate.

***Geoglossum pumilum* WINT.**

*Geoglossum pumilum* WINT. Grevillea, XV, 91, 1887—SACC. Syll. Fung. VIII, 46, 1889; Ibid. X, 2, 1892—SCHROET. in ENGLER & PR. Nat. Pl. Fam. I, 1, 165, 1894—MASS. Ann. Bot. XI, 252, 1897—DURAND, Mycologia, XIII, 184, 1921—SEEVER, Mycologia, XVII, 49, 1925—SEEVER & CHARDON, Sci. Surv. Porto Rico & Virg. Isl. VIII, 74, 1926.

Nom. jap. *Ko-tengu-no-tamabari*.

Ascomatibus parvis, atro-brunneis vel nigris, capitatis, 0.5-2 cm. longis; clavulis subglobosis, ovatis, clavato-ellipsoideis vel subdifformibus, apice rotundatis, atro-brunneis vel atris, distinctis, parum et irregulariter compressis, glaberrimis, 1-3 mm. longis crassisque; stipitibus teretis, gracillimis, subaequalibus, atro-brunneis, saepe parum compressis et sulcatis, squamulosis (fasciculis pilorum fuscidulis squarrosis obsitis), 4-17 mm. longis, 0.5-0.8 mm. crassis; ascis clavatis vel cylindraceo-clavatis, apice obtusis sed contractis, poro iodo caerulescentibus, octosporis, 200-250 × 20-27.5  $\mu$ ; sporis parallele positis, fere cylindraceis, utrimque parum angustatis rotundatisque, rectis vel leviter curvatis, fuliginis, plerumque 15-septatis, 100-137 × 4-6  $\mu$ ; paraphysibus ascis longioribus, inferne filiformibus subhyalinis, sursum in clavam crassam fuscidulam usque ad 10(-12)  $\mu$  latam incrassatis, interdum apicem versus articulatis, rectis vel interdum curvatis.

Hab. in terra argillacea, interdum in muscos, autumnno.

Typus in Herb. WINTER.

Loc. typ.: Prope Sao-Francisco, Brasilia, America austr.

Area distr.: America austr. (Brasilia) et borealis, Asia orient. (Japonia).

Exempl. invest.:

Hokkaido—Ishikari: Nopporo (S. IMAI, Oct. 2, 1932; Oct. 15, 1933).

The present fungus is clearly characterized by the minute, capitate ascophores, as well as by the 15-septate spores and the robust, comparatively long remotely septate paraphyses.

As far as the writer is aware, the distribution of this species has been recorded in Brazil, Bermuda, Porto Rico and Virginia of South and North

America, and now the writer adds north eastern Asia far distant from the countries above mentioned.

The measurements of the asci and spores given by WINTER and DURAND are as follows:

WINTER (1886) asci  $230-255 \times 25-27 \mu$ ; spores  $94-110 \times 7 \mu$ , 15-septate.

DURAND (1921) asci  $185-200 \times 20-25 \mu$ ; spores  $104-125(110-115) \times 6 \mu$ ,  
15-septate.

### *Trichoglossum* BOUD.

*Geoglossum* Auct. pro parte.

*Trichoglossum* BOUD. Bull. Soc. Myc. Fr. I, 110, 1885; Hist. Class. Disc. Eur. 86, 1907—DURAND, Ann. Myc. VI, 433, 1908—LUIJK, Kruidk. Arch. Jaarg. 1918, 134, 1919—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 146, 1932.

*Geoglossum* Subg. *Trichoglossum* SACC. Syll. Fung. VIII, 45, 1889—SCHROET. Pilze Schles. II, 19, 1893; in ENGLER & PR. Nat. Pfl. Fam. I, 1, 165, 1894—REHM, Pilze Deut., Hyst. & Disc. 1157, 1896—UNDERW. Minn. Bot. Stud. I, 484, 1896.

Ascoma carnosum, siccum, erectum, stipitatum, clavatum, sursum ascigerens, atrum vel brunneo-atrum. Asci clavati, inoperculati, octospori vel quadrispori; sporae fasciculatae vel multiseriatae, cylindraceo-clavatae, 3-15-septatae, fuligineae; paraphyses filiformes, septatae, sursum brunneae, solum clavam tegentes; cystidia in clavulam stipitemque praesentia, atro-brunnea vel atra, crasso-circumdata, acicularia, vulgo ascis longiora.

Typus: *Geoglossum hirsutum* PERS. ex FR.

BOUDIER's proposal is right and acceptable that the genus *Trichoglossum* based upon *Geoglossum hirsutum* should be separated from *Geoglossum* of which the type species is indicated as *G. glabrum*, because of the presence of spines on the hymenium and stipe by which the ascophores are given a velvety appearance.

### Clavis specierum.

- I. Sporae normale 100-170  $\mu$  longae.
  - A. Asci normale octospori.
    1. Sporae vulgo 15-septatae ..... *T. hirsutum*.
    2. Sporae vulgo 8-14-septatae, raro 15-septatae ..... *T. h.* var. *variabile*.
- II. Sporae normale 45-100  $\mu$  longae.
  - A. Sporae 0-5-septatae ..... *T. Farlowi*.

B. Sporae 7-septatae.

i. Sporae 75-100  $\mu$  longae ..... *T. Walteri*.

***Trichoglossum hirsutum* (PERS. ex FR.) BOUD.**

*Clavaria simplex hirsuta* SCHMIDEL, Icon. Pl. 92, t. 25, 1762.

*Geoglossum hirsutum* PERS. in ROEMER N. Mag. Bot. I, 117, 1794 (sec. DURAND); Comm. Fung. Clav. 37, 1797; Syn. Fung. 608, 1801—NEES, Syst. Pilze, 172, t. 17, f. 157 $\alpha\beta$ , 1817.

*Geoglossum hirsutum* FR. Syst. Myc. I, 488, 1821, excl. b; Epicr. Myc. 583, 1838; Summa Veg. Scand. 347, 1849—BERK. in SMITH Engl. Fl. V, 2, 178, 1836; Outl. Brit. Fung. 362, t. 22, f. 2, 1860—FUCK. Symb. Myc. 333, 1869—CKE. Handb. Brit. Fung. 663, 1871; Mycogr. I, 3, t. 1, f. 3, 1875; Handb. Austr. Fung. 251, 1862—KARST. Myc. Fenn. I, 31, 1871—QUÉL. Champ. Jura Vosg. II, in Mém. Soc. D'Emul. Montb. 2 sér. V, 384, 1873; Ench. Fung. 266, 1886—GILL. Disc. Er. 24, cum fig. 1879—PHILLIPS, Brit. Disc. 34, t. 2, f. 9, 1887—SACC. Syll. Fung. VIII, 46, 1889—SCHROET. Pilze Schles. II, 19, 1893; in ENGLER & PR. Nat. Pfl. Fam. I, 1, 165, f. 139, 1894—PAT. & LAGERH. Bull. Soc. Myc. Fr. IX, 145, 1893—MASS. Brit. Fung. Fl. IV, 492, 1895; Ann. Bot. XI, 241, t. 12, f. 31-32, 1896—REHM, Pilze Deut., Hyst. & Disc. 1157, 1896—UNDERW. Minn. Bot. Stud. I, 494, 1896—PAT. Ann. Jard. Bot. Buitenz. 1 Suppl. 120, 1897—HONE, Minn. Bot. Stud. III, 316, t. 3, f. 5, t. 5, f. 1-4, 1904—LIND, Dan. Fung. 89, 1913—LLOYD, Geoglossaceae, 12, f. 793, 1916—KILLERM. Krypt. Forsch. No. 3, 149, 1918—CHIPP, Gardn. Bull. Strait. Settl. II, 320, 1921—KAWAMURA, Jap. Fung. no. 82, 1929—RICK, Broteria, Bot. XXV, 72, 1931—MARTENS, Bull. Soc. Myc. Fr. LII, 386, 1937.

*Trichoglossum hirsutum* BOUD. Bull. Soc. Myc. Fr. I, 110, 1885; Hist. Class. Disc. Eur. 86, 1907—DURAND, Ann. Myc. VI, 436, t. 9, f. 78-80, t. 17, f. 176-181, 1908—RAMSB. Trans. Brit. Myc. Soc. IV, 370, 1914—LUIJK, Kruidk. Arch. Jaarg. 1918, 134, f. 9, 1919; Meded. Rijks Herb. Leiden, No. 39, 8, f. 4, 1919—OVERH. Mycologia, XII, 142, 1920—ZELLER, Mycologia, XIV, 176, 1922—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932—TENG, Contr. Biol. Lab. Sci. Soc. China, VII, 89, 1932; Ibid. VIII, 52, 1932—POVAH, Papers Mich. Acad. Sci. XX, 132, 1935—IMAI, Ann. Myc. XXXVIII, 277, 1940—WEHM. Canad. Journ. Research, XVIII, 540, 1940.

*Geoglossum hirsutum* f. *Braziliense* P. HENN. Hedwigia, XXXIV, 113, 1895 (teste DURAND)—DURAND, Mycologia, XIII, 187, 1921.

Nom. jap. *Tengu-no-meshugai*.

Ascomatibus solitariis vel gregariis, atris, 2-8 cm. longis; clavulis lanceolatis, ellipsoideis, oblongis vel subglobosis, obtusis, plus minusve compressis raro longitudinaliter lacunosis, velutinis, 1.0-2.2 cm. longis, 5-15 mm. latis, 1/10-1/3 ascomatae loculis, delimitatis; stipitibus teretis vel rarissime compressis, aequalibus, usque ad 6 cm. longis, 2-3.5 mm. crassis, dense velutinis, atris; ascis late clavatis, apice contractis, poro

iodo caerulescentibus, 190–240 × 20–25  $\mu$ , octosporis; sporis parallele positis, cylindraceo-clavatis, utrimque obtusis sed attenuatis, brunneis, primo continuis, demum 15-septatis, 100–170 × 5–7.5  $\mu$ ; paraphysibus filiformibus, septatis, brunneis, apicibus leviter incrassatis et vulgo curvatis vel circinatis; cystidiis numerosis, acicularibus, rectis, acutis, atris vel atro-brunneis, opacis, 8–10  $\mu$  crassis, longitudine variabilis, circa  $\frac{1}{3}$  longitudinis projectis.

Hab. ad truncos putridos vel humum inter folias, aestate—autumno.

Typus in Herb. PERSOON, in Rijks Herb., Leiden.

Loc. typ.: ignotum.

Area distr.: Europa, America borealis et australis, Asia orient. (Japonia, Sina), Asia trop. (Java & Singapore), Australia.

Exempl. invest.:

Hokkaido—Kushiro: Akan (S. IMAI, Sept. 14, 1927; Sept. 15, 1933).

Ishikari: Nopporo (S. IMAI, Sept. 4, 1927; Sept. 1, 1935).

Honshû—Shinano: Kiso, Ôdaki (S. IMAI, Sept. 20, 1938). Musashi: Kobotoke-tôge (Y. KOBAYASI, Oct. 14, 1936)

The present fungus is one of the most common and widely distributed species in this family. It is readily distinguished by the long, regularly 15-septate spores, tapering each way from above the middle. DURAND recorded the spore-measurement of PERSOON's type as 98–150  $\mu$  long and in the majority more than 120  $\mu$  long.

The measurements of the asci and spores given by various authors are as follows:

- |                  |   |
|------------------|---|
| FUCKEL (1869)    | spores 126 × 8 $\mu$ , 15-septate.  |
| COOKE (1875)     | spores 150 $\mu$ long.  |
| " (1892)         | asci 200 × 20–25 $\mu$ ; spores 120–150 × 6–8 $\mu$ , 12–15-septate.              |
| KARSTEN (1871)   | asci 200 × 20–25 $\mu$ ; spores 106–124 × 6 $\mu$ , 12–15-septate.                |
| SACCARDO (1889)  | asci 200 × 20–25 $\mu$ ; spores 120–150 × 6–8 $\mu$ , 12–15-septate.              |
| SCHROETER (1893) | asci 200–230 × 17–20 $\mu$ ;<br>spores 100–120 × 5–7 $\mu$ , 10–16-septate.       |
| REHM (1896)      | asci 150–220 × 20–25 $\mu$ ; spores 100–120 × 5–6 $\mu$ , 14–16-celled.           |
| MASSEE (1897)    | asci 160–220 × 18–20 $\mu$ ; spores 110–150 × 5–6 $\mu$ , 7–15-septate.           |
| HONE (1904)      | spores 100–120 × 4–7 $\mu$ , 16-celled.   |
| RICK (1931)      | asci 200 × 20–25 $\mu$ ; spores 120–150 × 6–8 $\mu$ , 12–15-septate.              |
| DURAND (1908)    | asci 210–225 × 20–22 $\mu$ ;<br>spores 100–160(120–150) × 6–7 $\mu$ , 15-septate. |
| LUIJK (1919)     | asci 180–240 × 20–25 $\mu$ ; spores 100–160 × 5–7 $\mu$ , 15-septate.             |
| KOBAYASI (1939)  | asci 200–220 × 20 $\mu$ ; spores 120–157 × 6.5 $\mu$ , 15-septate.                |

According to DURAND's report, the type of *Trichoglossum hirsutum* f. *Braziliense* P. HENN. is a typical *T. hirsutum*, of which the spores are regularly 15-septate, 138-160  $\mu$  long, tapering each way from above the middle, instead of 12-14-septate as stated in P. HENNINGS's original description.

The present fungus is very variable in form according to the age of development and habitat. In material at hand, the following forms and variety are able to be distinguished.

***T. hirsutum* f. *capitatum* (PERS.) IMAI, comb. nov.**

*Geoglossum capitatum* PERS. Obs. Myc. I, 11, 1796.

*Geoglossum hirsutum*  $\beta$  *capitatum* PERS. Syn. Fung. 608, 1801.

*Geoglossum hirsutum* b. *capitatum* FR. Syst. Myc. I, 488, 1821—RABENH. Deut. Krypt. Fl. I, 328, 1844.

*Geoglossum hirsutum* var. *capitatum* GILL. Disc. Fr. 24, 1879—RICK, Broteria, Bot. XXV, 73, 1931.

*Geoglossum capitatum* LLOYD, Geoglossaceae, 12, f. 794, 1916—KAWAMURA, Jap. Fung. no. 211, 1929.

*Trichoglossum hirsutum* var. *capitatum* BOUD. Hist. Class. Disc. Eur. 86, 1907—KOBAYASI, Nippon Inkwas. Dukan, 309, t. 145, f. 3-4, 1939.

Nom. jap. *Ko-tengunomesligai*.

Ascomatibus mediis; clavulis capitatis, globosis vel subglobosis, saepe compressis; cetera ut in f. typica.

Hab. ad terram in silvis vel ad truncos putridos, aestate—autumno. Typus in Herb. PERSOON, in Rijks Herb., Leiden.

Loc. typ.: ignotum.

Area distr.: Europa, America bor. et austr., Asia orient. (Japonia).

Exempl. invest.:

Hokkaido—Kushiro: Akan (S. IMAI, Sept. 15, 1933). Ishikari: Nopporo (S. IMAI, Sept. 23, 1923; Oct. 7, 1927; Oct. 21, 1928; Sept. 28, Oct. 8, 17, 1930; Oct. 4, 11, 1931; Oct. 2, 1932); Jōzankei (K. KAWAI, Sept. 17, 1930); Monte Soranuma (S. IMAI, Sept. 19, 1930). Iburi: Shikotsu (S. IMAI, Sept. 23, 1929; Sept. 19, 1931; Sept. 10, 1935); Tōya (Y. TOCHINAI, Sept. 27, 1932).

Honshū—Rikuzen: Sendai (A. YASUDA, Sept. 13, 1914 in Herb. YASUDA, in Herb. Tokyo Sci. Mus.). Shimotsuke: Nikko (NAGAHISA, Jul. 2, 1930). Sagami: Zushi (R. IMAZEKI, Sept. 29, 1935, in Herb. Tokyo Sci.

Mus). Kai: Masutomi-mura (S. IMAI, Sept. 26, 1940). Kii: Tanabe (K. MINAKATA, Jul. 12, 1910, ex Herb. MINAKATA). Yamashiro: Kyôto (K. MATSUO, Jul. 22, 1931; T. HEMMI, Jul. 24, 1931, in Herb. HEMMI, Univ. Imp. Kyoto).

The present fungus is nothing more than a capitate form of *T. hirsutum* and is not a constant variety but hardly a form. The writer, however, proposed to separate this form in order accurately to indicate the capitate form which is rather more frequently met with and collected than the typical ellipsoidal form in our country.

***T. hirsutum* f. *depauperatum* (LLOYD) S. ITO et IMAI**

*Geoglossum hirsutum* f. *depauperatum* LLOYD, Myc. Writ. V, Myc. Notes No. 49, 760, f. 1047, 1917.

*Trichoglossum hirsutum* f. *depauperatum* S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932.

Nom. jap. *Hina-tengunomesligai*.

Ascomatibus pusillis, usque ad 1.5 cm. longis; clavulis clavatis, capitatis vel irregularibus; cetera ut in f. typica.

Hab. ad arenosam in muscis, hiemi.

Typus in Herb. LLOYD, in Herb. Instit. Smithoniana, Amer. bor.

Loc. typ.: Nagoya, Prov. Owari, Honshû, Japonia.

Area distr.: Japonia.

Exempl. invest.:

Honshû—Owari: Nagoya (J. UMEMURA, Dec. 1916, ex Herb. UMEMURA).

The present fungus is only a depauperate form probably caused by its habitat on sandy soil.

***T. hirsutum* var. *variabile* (DURAND) IMAI, comb. nov.**

*Trichoglossum hirsutum* f. *variabile* DURAND, Ann. Myc. VI, 437, t. 9, f. 84-85, t. 17, f. 182-184, 1908—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932.

Nom. jap. *Kawari-tengunomesligai*.

Sporis variabilis, (80-)100-(150-)170  $\mu$  longis, 8-15-septatis (plurima 11-14-septatis); paraphysibus apicibus vulgo subrectis vel subcurvatis; cetera ut in f. typica.

Hab. ad humum, aestate—autumno.

Typus in Herb. DURAND, Univ. Cornell, Ithaca, N. Y., Amer. bor.

Loc. typ.: Knoxboro, N. Y., Amer. bor.

Area distr.: America bor., Asia orient. (Japonia), Europa.

Exempl. invest.:

Hokkaido—Ishikari: Nopporo (S. IMAI, Sept. 18, 1932). Iburi: Chitose (S. IMAI, Sept. 7, 1927); Shikotsu (S. IMAI, Sept. 15, 1934; Sept. 10, 1935).

Honshû—Mutsu: Towada-mura (S. IMAI, Sept. 25, 1935; Sept. 20, 1937).

DURAND gave the measurement of the spore-length for this fungus as 80-150  $\mu$ , whereas in the material at hand it is 100-170  $\mu$  long and very rarely contains a 15-septate one. DURAND's cotype specimen also rarely contains 15-septate spores, although he illustrated a 16-septate spore.

### *Trichoglossum Farlowi* (CKE.) DURAND

*Geoglossum Farlowi* CKE. Grevillea, XI, 107, 1883—SACC. Syll. Fung. VIII, 45, 1889—UNDERW. Minn. Bot. Stud. I, 494, 1896—MASS. Ann. Bot. XI, 243, 1897, excl. f. *velutipes*—LLOYD, Geoglossaceae, 13, 1916.

*Geoglossum hirsutum* f. *Farlowi* BURT, Rhodora, I, 63, t. 4, f. 4-4c, 1899.

*Trichoglossum Farlowi* DURAND, Ann. Myc. VI, 438, t. 10, f. 89-92, t. 18, f. 186-189, 1908—MAINS, Papers Mich. Acad. Sci. XX, 82, 1935—WEHM. Canad. Journ. Research, XVIII, 540, 1940.

*Geoglossum rotundiforme* KAWAMURA, Jap. Journ. Bot. IV, 301, f. 17-22, 1929; Jap. Fung. no. 168, 1929.

*Trichoglossum rotundiforme* KAWAM. apud S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932—KOBAYASI, Nippon Inkwas. Dukan, 311, t. 146, f. 6-9, 1939.

*Trichoglossum Farlowi* var. *rotundiforme* TENG, Sinensia, VI, 186, 1935.

Nom. jap. *Tengu-no-shamoji*.

Ascomatibus solitariis, gregariis vel subcaespitosis, 2-6 cm. longis, clavatis; clavulis lanceolatis, non-numquam rotundatis, compressis, leviter delimitatis, brunneo-atris, circ.  $\frac{1}{3}$  ascomatae loculis, 1-3 cm. longis, 3-5 mm. vel ultra crassis; stipitibus teretibus, aequalibus, saepe flexuosis, raro paulo compressis, 2 mm. crassis, 2-4 cm. longis, atris, dense velutinis; ascis clavatis, apice paulo contractis sed rotundatis, poro iodo caerulescentibus, 170-240  $\times$  15-22.5  $\mu$ , octosporis; sporis multiseriatis, clavato-cylindraceutis,

utrimque non vel vix attenuatis, fuliginis vel brunneolis,  $47-90 \times 5-7 \mu$ , continuis vel 1-3-5-septatis, rectis vel leviter curvatis; paraphysibus filiformibus, septatis, sursum curvatis vel circinatis, paulo incrassatis, brunneolis; cystidiis acicularibus, numerosis, rectis, acutis, atris vel atro-brunneis, opacis, longitudine variabilis, circa  $\frac{1}{3}-\frac{1}{2}$  longitudinis projectis.

Hab. ad terram in graminosis, vel inter muscos, aestate—autumno.

Typus in Herb. Kew, Anglia.

Loc. typ.: Newton, Mass., America bor.

Area distr.: America borealis, Asia orient. (Japonia, Sina).

Exempl. invest.:

Hokkaido—Kushiro; Akan (S. IMAI, Sept. 15, 1933). Ishikari: Nopporo (S. IMAI, Sept. 1, 1935). Iburi: Shikotsu (S. IMAI, Sept. 19, 1931; Sept. 15, 1934; Sept. 9, 10, 1935).

Honshû—Ugo: Nishidate-mura (M. MATSUDA, Sept. 1936, in Herb. Tokyo Sci. Mus.). Kii: Seto (K. MINAKATA, Jul. 13, 1902, ex Herb. MINAKATA). Yamashiro: Kyoto (I. MATSUURA, Oct. 29, 1931; T. ITO, Oct. 13, 1935, in Herb. HEMMI, Univ. Imp. Kyoto). Tanba: Chii-mura (S. IMAI, Oct. 10, 1941).

The fungus is characterized mainly by the clavato-cylindrical spores which are either continuous or 1-3-5-septate and less than  $100 \mu$  in length.

*Geoglossum rotundiforme* KAWAM. is only a flattened rounded form in the clavula of this species, and it occurs often mingled with the typical clavate form.

The measurements of the asci and spores given by various authors are as follows:

COOKE (1883) spores  $0.07 \times 0.005$  mm., 3-septate.

DURAND (1908) asci  $170-200 \times 15-18 \mu$ ;

spores  $48-85(60-75) \times 6 \mu$ , 1-3-5-septate.

For *Geoglossum rotundiforme*:

KAWAMURA (1929) spores  $70-90 \times 5-6 \mu$ , 1-5 (mostly 3) septate.

" (1929) asci  $150-180 \times 12-15 \mu$ ;

spores  $70-90 \times 5-6 \mu$ , 1-6 (mostly 3) septate.

KOBAYASI (1939) asci  $160-180 \times 12-15 \mu$ ;

spores  $60-75 \times 5-6 \mu$ , 3-5-septate.

### *Trichoglossum Walteri* (BERK.) DURAND

*Geoglossum Walteri* BERK. apud CKE. Hedwigia, XIV, 39, 1875—CKE. Mycogr. I, 4, t. 1,

f. 4, 1875—SACC. Syll. Fung. VIII, 45, 1889—OVEREEM, Bull. Jard. Bot. Buitenz. 3 sér. V, 249, f. 2, d, 1923—BOEDIJN, Bull. Jard. Bot. Buitenz. 3 sér. XVI, 366, 1940.

?*Geoglossum hirsutum* f. *Walteri* MASS. Ann. Bot. XI, 243, t. 13, f. 78-80, 1897.

*Geoglossum Rehmanum* P. HENN. Hedwigia, XXXIX, (80), 1900 (teste DURAND)—SACC. Syll. Fung. XVI, 699, 1902—RICK, Broteria, Bot. XXV, 73, 1931.

?*Trichoglossum hirsutum* var. *Doassansii* PAT. Bull. Soc. Myc. Fr. XXV, 129, 1909—SACC. Syll. Fung. XXII, 607, 1913.

*Trichoglossum Walteri* DURAND, Ann. Myc. VI, 440, t. 10, f. 54-97, t. 18, f. 190-193, 1908—KAUFFM. Mycologia, IX, 160, 1917—S. ITO et IMAI, Proceed. Jap. Assoc. Ady. Sci. VII, 148, 1932—MAINS, Papers Mich. Acad. Sci. XX, 82, 1935—IMAI, Ann. Myc. XXXVIII, 277, 1940.

Nom. jap. *Nanafushi-tengunomeshigai*.

Ascomatibus gregariis vel solitariis, atris vel brunneo-atris, 3-7 cm. vel ultra longis; clavulis ellipsoideis vel lanceolatis, obtusis, compressis, vix vel non delimitatis,  $\frac{1}{3}$ - $\frac{1}{2}$  ascomatae loculis, atris, 1-2 cm. longis, 3-5 mm. vel ultra latis; stipitibus teretibus vel compressis, subaequalibus, saepe flexuosis, dense velutinis, atris, circ. 2 mm. crassis; ascis clavatis vel subfusiformibus, apice obtusis sed contractis, poro iodo caerulescentibus, 160-225  $\times$  14-22.5  $\mu$ , octosporis; sporis multiseriatis, cylindraco-clavatis vel subcylindracois, fuligineis vel brunneis, primo continuis multiguttulatisque, demum 7-septatis, 52-112.5  $\times$  5-7.5  $\mu$ ; paraphysibus filiformibus, septatis, apicibus leviter incrassatis curvatisque circinatisve, sursum brunneis; cystidiis acicularibus, numerosis, rectis, acutis, brunneis vel nigrescentibus, opacis, 7.5-12.5  $\mu$  crassis, longitudine variabilis,  $\frac{1}{4}$ - $\frac{1}{2}$  longitudinis projectis.

Hab. ad truncos putridos vel humum, aestate—autumno.

Typus in Herb. Kew, Anglia.

Loc. typ.: Wild Dog Creek, Apollo Bay, Australia.

Area distr.: Australia, Europa (Gallia, Norvegia), America bor. et austr. (Brasilia), Asia orient. (Japonia, Sina), Asia trop. (India orient.).

Exempl. invest.:

Hokkaido—Ishikari: Nopporo (S. IMAI, Sept. 4, 1927; Sept. 28, Oct. 17, Nov. 9, 1930; Oct. 4, 11, 1931; Oct. 2, 23, 1932; Oct. 15, 1933; Aug. 18, 1935; Aug. 29, 1936; Oct. 28, 1940). Iburî: Chitose (S. IMAI, Sept. 7, 1927); Shikotsu (S. ITO, Oct. 11, 1927; S. ITO et IMAI, Sept. 23, 1929; S. IMAI, Sept. 19, 1931; S. KAMEI, Nov. 1, 1933). Oshima: Ônomura (S. IMAI, Sept. 21, 1935).

Honshû—Shinano: Azumi-mura (S. IMAI, Sept. 7, 10, 1938); Kiso, Ôdaki (S. IMAI, Sept. 20, 1938); Owari (J. UMEMURA, Oct. 1918, in Herb.

UMEMURA). Kii: Tanabe (S. ISHIKAWA, Oct. 9, 1910, ex Herb. MINAKATA). Yamashiro: Kibune (S. AKAI, Jul. 28, 1931, in Herb. HEMMI, Univ. Imp. Kyoto).

The present fungus is characterized principally by the long, slender, nearly cylindrical spores which become regularly seven-septate at maturity.

DURAND ascertained that the type of *Geoglossum Rehmianum* P. HENN. from Brazil is nothing other than the present species. *Trichoglossum hirsutum* var. *Doassansii* PAT., as far as the diagnosis only is concerned, is also probably the same as the present species.

*Geoglossum hirsutum* f. *Walteri* MASS., judging from the diagnosis only, seems to be not identical with this.

The measurements of the asci and spores given by various authors are as follows:

COOKE (1875)	spores 100 $\mu$ long, 3-7-septate.
SACCARDO (1889)	spores 100 $\times$ 5-6 $\mu$ , 3-7-septate.
DURAND (1908) asci 175-200 $\times$ 18-20 $\mu$ ;	
	spores 82-107(87-100) $\times$ 6 $\mu$ , 7-septate.

For *Trichoglossum Rehmianum*:

P. HENNINGS (1900) asci 150-160 $\times$ 13-16 $\mu$ ;	
	spores 60-65 $\times$ 4-4.5 $\mu$ , 3-7-septate.
RICK (1931) asci 150-160 $\times$ 13-16 $\mu$ ;	spores 60-65 $\times$ 4-4.5 $\mu$ , 3-7-septate.
DURAND (1921)	spores 78-103(90-95) $\times$ 5 $\mu$ .

For *T. hirsutum* var. *Doassansii*:

PATOUILLARD (1909)	spores 85-95 $\times$ 4-5 $\mu$ , 7-septate.
--------------------	--

### *Gloeoglossum* DURAND

*Geoglossum* Auct. pro parte.

*Gloeoglossum* DURAND, Ann. Myc. VI, 418, 1908—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 146, 1932.

Ascoma viscosum, clavatum, stipitatum, sursum ascigerens, atrum vel brunneo-atrum. Asci cylindraceo-clavati, inoperculati, octospori; sporae parallele positae vel multiseriatae, cylindraceo-clavatae, 3-15-septatae, fuliginosae; paraphyses filiformes, septatae, apicibus piriformibus vel globosis incrassatae vel sursum leviter incrassatae, rectae vel circinatae, brunneae, non solum clavulam sed etiam stipitem usque ad basim tegentes.

Typus: *Geoglossum difforme* FR.

The proposal of DURAND separating the present genus from *Geoglossum* is reasonable and acceptable. The general aspect of this genus is that of *Geoglossum* and *Melanoglossum* or *Microglossum*, but the distinct characters are the viscid-gelatinous consistency when fresh, and the fact that the paraphyses are not confined to the hymenium but continue with unchanged form down the stipe to its base, thus forming a thick gelatinous ectal layer or coating over it. The paraphyses continue in the same abundance and with the same peculiar form as those in the hymenium.

In North America, three species, *Gl. difforme*, *Gl. glutinosum* and *Gl. affine* have been reported, in Europe, about four species, *Gl. difforme*, *Gl. glutinosum*, *Gl. Barlae* (BOUD.) and *Gl. umbratile* (SACC.), whereas in Japan two of the most common species have been reported. *Geoglossum bogoriense* P. HENN. et E. NYM. from Java also belongs here.

#### Clavis specierum

1. Sporae 0-7-septatae, clavato-cylindratae, 55-102  $\mu$  longae; paraphyses apicibus globosae ...  
..... *Gl. glutinosum*.
2. Sporae 15-septatae, clavato-cylindratae, 95-125  $\mu$  longae; paraphyses apicibus leviter incrassatae et valde circinatae ..... *Gl. difforme*.

#### *Gloeoglossum glutinosum* (PERS. ex FR.) DURAND

*Geoglossum glutinosum* PERS. Obs. Myc. I, 11, 1796; Comm. Fung. Clav. 38, 1797; Syn. Fung. 609, 1801.

?*Geoglossum viscosum* PERS. Comm. Fung. Clav. 39, 1797; Syn. Fung. 609, 1801 (Cf. LUIJK, Meded. Rijks Herb. Leiden, No. 39, 8, 1919).

*Geoglossum glutinosum* FR. Syst. Myc. I, 489, 1821; Epicr. Myc. 582, 1838; Summa Veg. Scand. 347, 1849—BERK. in SMITH Engl. Fl. V, 2, 178, 1836; Outl. Brit. Fung. 362, 1860—CKE. Handb. Brit. Fung. 663, 1871; Mycogr. I, 5, t. 2, f. 6, 1875—KARST. Myc. Fenn. I, 30, 1871—QUÉL. Champ. Jura Vosg. II, in Mém. Soc. L'Emul. Montb. 2 sér. V, 384, 1873; Ench. Fung. 266, 1886—PHILLIPS, Brit. Disc. 38, 1887—SACC. Syll. Fung. VIII, 42, 1889—SCHROET. Pilze Schles. II, 18, 1893; in ENGLER & PR. Nat. Pfl. Fam. I, 1, 165, 1894—MASS. Brit. Fung. Fl. IV, 490, 1895; Ann. Bot. XI, 245, t. 13, f. 66-67, 1897—REHM, Pilze Deut., Hyst. & Disc. 1154, 1896—LIND, Dan. Fung. 89, 1913—LLOYD, Geoglossaceae, 9, f. 782, 1916—WEHM. Canad. Journ. Research, XVIII, 540, 1940.

*Geoglossum viscosum* FR. Syst. Myc. I, 489, 1821; Epicr. Myc. 583, 1838; Summa Veg. Scand. 347, 1849—BERK. in SMITH Engl. Fl. V, 2, 178, 1836—FUCK. Symb. Myc. 333, 1869—CKE. Handb. Brit. Fung. 663, 1871; Mycogr. I, 7, t. 3, f. 10, 1875—GILL. Disc. Fr. 25, cum fig. 1879—PHILLIPS, Brit. Disc. 37, 1887—SACC. Syll. Fung. VIII, 42, 1889—SCHROET. Pilze

Schles. II, 19, 1893—MASS. Brit. Fung. Fl. IV, 490, 1895—REHM, Pilze Deut., Hyst. & Disc. 1154, 1896—UNDERW. Minn. Bot. Stud. I, 495, 1896.

*Geoglossum glutinosum*  $\beta$  *lubricum* PERS. Myc. Eur. I, 197, 1822 (teste DURAND).

*Geoglossum Muelleri* BERK. in CKE. Mycogr. I, 4, t. 1, f. 2, 1875; Hedwigia, XIV, 10, 1875 (teste MASSEE); Handb. Austr. Fung. 251, 1892—SACC. Syll. Fung. VIII, 43, 1889.

***Gloeoglossum glutinosum*** DURAND, Ann. Myc. VI, 419, t. 8, f. 70-72, t. 14, f. 149-155, 1908—LUIJK, Kruidk. Arch. Jaarg. 1918, 126, f. 5, 1919; Meded. Rijks Herb. Leiden, No. 39, 3, 1919.

Nom. jap. *Nanafushi-tengunohanayasuri*.

Ascomatibus solitariis, gregariis vel subcaespitosis, clavatis, viscoso-gelatinosis, 3-8 cm. longis, atris; clavulis 1-2.5 cm. longis, 5-10 mm. crassis,  $\frac{1}{4}$ - $\frac{1}{5}$  ascomatae loculis, clavatis vel anguste ellipsoideis, vulgo compressis, obtusis, vix vel leviter distinctis, atris; stipitibus teretibus vel leviter compressis, brunneo-atris, levibus, viscosissimis; ascis anguste-clavatis, poro iodo caerulescentibus, octosporis,  $225-330 \times 12-15 \mu$ ; sporis cylindraceutis vel utrimque rotundatis sed leviter contractis, fuliginis, primo continuis, dein 3-septatis, demum majoribus 7-septatis, multiseriatis,  $(55-75-100 \times 5(-6) \mu$ ; paraphysibus filiformibus, circa  $2.5-3 \mu$  crassis, septatis, ascis longioribus, brunneolis, apice abrupte piriformi- vel subglobose-incrassatis, usque ad  $7.5-10 \mu$  crassis, rectis vel leviter curvatis.

Hab. ad terram in silvis, aestate—autumno.

Typus in Herb. PERSON, in Rijks Herb., Leiden.

Loc. typ.: ignotum.

Area distr.: Europa, America bor., Asia orient. (Japonia).

Exempl. invest.:

Hokkaido—Kushiro: Akan (S. IMAI, Sept. 15, 1933). Ishikari: Noporo (S. IMAI, Sept. 1, 1935). Iburi: Shikotsu (S. IMAI, Sept. 19, 1931).

Honshu—Shinano: Azumi-mura (S. IMAI, Sept. 12, 1938).

The present fungus is principally characterized by the terete, viscid, brown stipe and rather elliptical, darker clavula, as well as by the 0-7-septate, nearly cylindrical spores and the long paraphyses with piriform to globose tips.

DURAND certified that the type of *G. glutinosum* var. *lubricum* PERS. completely agreed in all respect with this fungus except only having spores  $55-70 \mu$  long the greater number of which are 1-3-septate.

*Geoglossum viscosum* of many of the European authors is the same as the present species as has been claimed by MASSEE and DURAND.

MASSEE, after the examination of the type specimen, reported that *Geoglossum Muelleri* CKE. is nothing other than the present fungus, and the size of the spores, as given by COOKE in Mycographia, is too large and the paraphyses are in reality capitate.

Although DURAND suggested that *Cibarocoryne viscosula* HAZSL. is a related species to *Geoglossum alveolatum*, it seems to the writer to be very closely related to this fungus, except in respect to the areolate clavula.

The measurements of the asci and spores given by different authors are as follows:

For *Geoglossum glutinosum*:

- COOKE (1875) spores  $80 \mu$  long, 3-septate.  
 KARSTEN (1871) asci  $230-240 \times 12-14 \mu$ ; spores  $65-80 \times 5-6 \mu$ , 3-7-septate.  
 SACCARDO (1889) asci  $230-240 \times 12-14 \mu$ ; spores  $65-80 \times 5-6 \mu$ , 3-septate.  
 SCHROETER (1893) asci  $230-240 \times 12-14 \mu$ ;  
 spores  $65-80 \times 5-6 \mu$ , 3- rarely 6-7-septate.  
 MASSEE (1897) asci  $210-240 \times 12-14 \mu$ ; spores  $70-90 \times 5-6 \mu$ , 3-7-septate.  
 REHM (1896) asci  $200-240 \times 15-18 \mu$ ; spores  $60-80 \times 5-6 \mu$ , 4-celled.  
 DURAND (1908) asci up to  $250 \times 12-15 \mu$ ;  
 spores  $55-102(75-85) \times 5-6 \mu$ , 3-7-septate.  
 LLOYD (1916) spores  $60-100 \times 5-6 \mu$ , 3-7-septate.  
 LUIJK (1919) asci  $200-280 \times 11-15 \mu$ ; spores  $50-85 \times 4-6 \mu$ , 3-7-septate.

For *Geoglossum viscosum*:

- FUCKEL (1869) spores  $60 \times 7 \mu$ , 3-septate.  
 COOKE (1875) spores  $80-95 \mu$  long, 3-septate.  
 SACCARDO (1889) spores  $90-100 \times 5-6 \mu$ , 3-septate.  
 SCHROETER (1893) asci in spore bearing part  $88-110 \times 11 \mu$ ;  
 spores  $60 \times 4-5 \mu$ , 3-septate.  
 MASSEE (1895) spores  $70-90 \times 5-6 \mu$ , 3-septate.

For *Geoglossum Muelleri*:

- COOKE (1875) spores  $60-70 \mu$  long, 3- rarely 7-septate.  
 " (1892) spores  $60-70 \times 8-10 \mu$ , 3-septate.

### *Gloeoglossum difforme* (FR.) DURAND sensu DURAND

*Geoglossum difforme* FR. Obs. Myc. I, 195, 1815; Syst. Myc. I, 489, 1821—WEHM. Canad. Journ. Research, XVIII, 540, 1940.

*Geoglossum Peckianum* CKE. Grevillea, III, 150, 1875; Hedwigia, XIV, 10, 39, 1875; Mycogr. I, 5, t. 2, f. 5, 1875; Handb. Austr. Fung. 252, 1892—SACC. Syll. Fung. VIII, 45, 1889—UNDERW. Minn. Bot. Stud. I, 495, 1896—MASS. Ann. Bot. XI, 250, t. 12, f. 42-43, 1897—BURT, Rhodora,

I, 63, t. 4, f. 5-5b, 1899.

?*Geoglossum viscosum* [PERS.] QUÉL. Ench. Fung. 266, 1886.

*Gloeoglossum difforme* DURAND, Ann. Myc. VI, 421, t. 8, f. 75-77, t. 15, f. 156-160, 162-164, 1908—LUIJK, Kruidk. Arch. Jaarg. 1918, 128, f. 6, 1919—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932.

Nom. jap. *Tengu-no-hanayasuri*.

Ascomatibus gregariis vel solitariis, raro subcaespitosis, viscoso-gelatinosis, atris, clavatis, 3-7 cm. vel ultra longis; clavulis  $\frac{1}{4}$ - $\frac{1}{2}$  ascomatae loculis,

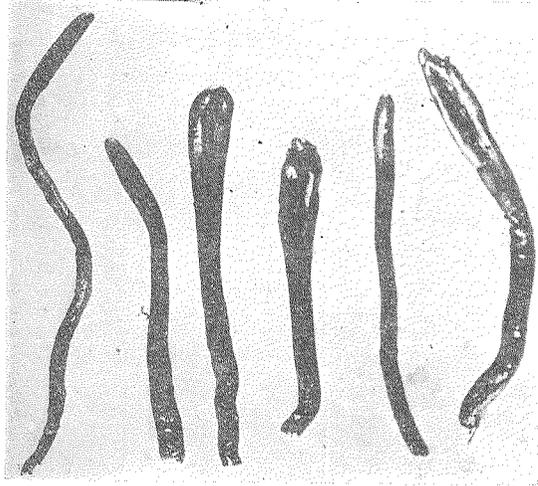


Fig. 3.

*Gloeoglossum difforme* (Specimina in Prov. Ishikari).

clavatis vel oblongis, obtusis, vulgo compressis canaliculatisque, non vel vix distinctis, atris, 0.5-1-1.4 cm. latis; carne brunnea; stipitibus teretibus vel compressis, levibus, viscosissimis, atris; ascis clavatis, apice rotundatis vel graduale contractis, poro iodo caerulescentibus,  $240-285 \times 15-2.25(-25) \mu$ , octosporis; sporis fuligineo-brunneis, clavato-cylindraccis, utrimque rotundatis sed leviter contractis, rectis vel leviter curvatis, demum 15-septatis,  $95-135 \times 5(-7) \mu$ ; paraphysibus filiformibus, tenuibus, septatis, ascis longioribus, apicibus leviter incrassatis, brunneolis, valde contortis circinatisque, in stipite praesentibus.

Hab. ad terram in silvis, aestate—autumno.

Typus in Herb. FRIES, in Uppsala.

Loc. typ.: ignotum.

Area distr.: Europa, America bqr., Asia orient. (Japonia).

Exempl. invest.:

Hokkaido—Ishikari: Jōzankei (S. IMAI, Oct. 23, 1927); Nopporo (S. IMAI, Oct. 17, 1930; Oct. 11, 1931; Oct. 2, 1932; Oct. 15, 1933; Aug. 18, 1935). Iburi: Shikotsu (S. IMAI, Sept. 15, 1934).

Honshū—Kōzuke: Katashina-mura, Marunuma (S. IMAI, Oct. 4, 1937). Shinano: Kiso, Ôdaki (S. IMAI, Sept. 20, 1938).

Although there may be some discussion concerning the real specific name of this fungus, the writer follows DURAND and uses *Gloeoglossum difforme* (FR.) DUR. instead of *G. Peckianum* CKE. of European authors.

The present fungus is characterized by the smooth, viscid, evenly clavate, much compressed ascophores, as well as by the 15-septate spores and the paraphyses much coiled at the slightly thickened tips.

The measurements of asci and spores given by other authors are as follows:

For *Gloeoglossum difforme*:

DURAND (1908) asci 240–275 × 18–25 μ; spores 95–125 × 6–7 μ.

LUIJK (1919) asci 195–275 × 18–25 μ; spores 95–125 × 5–7 μ.

For *Geoglossum Peckianum*:

COOKE (1875) spores 120 μ long.

" (1892) spores 120 × 6–7 μ.

SACCARDO (1889) spores 120 × 6–7 μ.

MASSEE (1897) asci 180–200 × 18–20 μ; spores 115–125 × 6–7 μ.

DURAND says that the present fungus is the commonest of the dark-spored species in the vicinity of Ithaca. In Japan, it also is common and is more frequently met and collected than *Gl. glutinosum*.

*Geoglossum viscosum* [PERS.] QUÉL., as far as the diagnosis is concerned, is the nearest to this.

### Subfam. **Cudonioideae** S. ITO et IMAI

*Leotiaceae* (ut Fam.) CORDA, Icon. Fung. V, 37, 1842, pro parte.

*Cudoniaceae* (ut Subfam.) KARST. Myc. Fenn. I, 5, 1871—DURAND, Ann. Myc. VI, 397, 1908, pro parte.

*Leotiés* (ut Fam.) BOUD. Bull. Soc. Myc. Fr. I, 109, 1885, pro parte.

*Geoglossacei* Grup. *Cudoniei* SCHROET. Pilze Schles. II, 20, 1893.

*Cudoniei* (ut Subf.) SCHROET. in ENGLER & PR. Nat. Pfl. Fam. I, 1, 163, 1894, pro parte.

*Leotieae* REHM, Pilze Deut., Hyst. & Disc. 1142 & 1161, 1896.

*Leotiacées* (ut Fam.) BOUD. Hist. Class. Disc. Eur. 87, 1907, pro parte.

**Cudonioideae** S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 144 & 147, 1932, pro parte—IMAI, Ann. Myc. XXXVIII, 277, 1940.

Ascoma stipitatum, rectum, pileatum; cetera ut in Familia.

Typus: *Cudonia* FR.

The present subfamily is represented by the pileate Geoglossaceous fungi.

In 1885, BOUDIER systematized the present family and established two families, Geoglossés and Leotiés. In the second family, Leotiés, he included the eight genera, *Heyderia*, *Mitrula*, *Leotia*, *Cudonia*, *Spathularia*, *Vibrissea*, *Apostemidium* and *Pilacre*. In 1907, he also included in his Leotiacées the nine genera, *Spathularia*, *Mitrula*, *Leotia*, *Cudonia*, *Cudoniella*, *Vibrissea*, *Apostemidium*, *Pilacre* and *Pulparia*.

SCHROETER included, in 1893, in his second group Cudonieï, the four genera, *Leotia*, *Cudoniella*, *Cudonia* and *Vibrissea*, whereas in 1894, the five genera, *Leotia*, *Cudoniella*, *Cudonia*, *Vibrissea* and *Roesleria* were placed in his second subfamily Cudonieï.

In 1908, DURAND reported four genera, *Leotia*, *Vibrissea*, *Apostemidium* and *Cudonia* in his subfamily Cudonieae from North America.

In 1932, however, J. A. NANNFELDT systematized the Inoperculate Discomycetes and proposed an Order Ostropales including one family Ostropaceae to which *Vibrissea* and *Apostemidium* were removed.

The writer excludes *Vibrissea* and *Apostemidium* from this subfamily in following NANNFELDT's opinion which is very acceptable, and proposes to divide the subfamily into two tribes, Leotieae and Cudonieae, by the spore character.

#### Clavis triborum et generum.

- I. Sporae late ellipsoideae, oblongo-fusiformes, ellipsoideo-oblongae vel subcylindraceae, continuae vel multiseptatae ..... Leotieae.
  - A. Sporae late ellipsoideae, continuae; ascoma gelatinosum ..... *Neocudoniella*.
  - B. Sporae oblongo-fusiformes vel ellipsoideo-oblongae, primo continuae, demum septatae; ascoma gelatinosum ..... *Leotia*.
  - C. Sporae subcylindraceae, longe continuae, demum uniseptatae; ascoma carnosum ..... *Sarcoleotia*.
- II. Sporae aciculares vel clavato-filiformes, demum multiseptatae ..... Cudonieae.
  - ..... *Cudonia*.

Trib. **Leotieae** REHM, emend. IMAI

**Leotieae** REHM, Pilze Deut., Hyst. & Disc. 1142 & 1161, 1896, pro parte.

Sporae ellipsoideae, oblongo-fusifformes, ellipsoideo-oblongae vel subcylindraceae, continuae vel multiseptatae; cetera ut in Subfamilia.

Typus: *Leotia* PERS. ex FR.

**Neocudoniella** IMAI, gen. nov.

Ascoma gelatinosum vel gelatinoso-carnosum, stipitatum, pileatum, rectum; pileus convexus, depresso-convexus, convexo-peltatus; stipes teretis vel compressus. Asci cylindraco-clavati vel clavati, inoperculati, octospori; sporae late-ellipsoideae, continuae, hyalinae, leves; paraphyses praesentes, filiformes.

Typus: *Cudoniella jezoensis* IMAI.

Etym.: Neos + *Cudoniella*.

The genus *Cudoniella* was established by SACCARDO basing upon *Leotia marcida* PERS. and three other species, and characterized "Ascoma hemisphaericum, subtus concavum, margine involutum, stipitatum, ceraceo-carnosum. Asci paraphysati octospori. Sporidia fusioidea, hyalina, continua v. plasmate 2-4-partito demum sinuate 1-3-septata." In SACCARDO's diagnosis, the genus is closely allied to *Leotia* from which it is scarcely distinguished by the waxy fructification in this genus as compared to the gelatinous in *Leotia*.

In 1893, SCHROETER emended the genus character, especially the spore character as "länglich-elliptisch oder spindelförmig, farblos, ohne deutliche Querwände", and reported *Leotia aquatica* LIB. and *L. acicularis* PERS.

CLEMENTS, in his Genera of Fungi, proposed a new genus name *Haplocybe* characterized by the "hyalospora in *Cudoniella*" basing upon *Leotia aquatica* LIB., but in the second edition with STEVENS, they adopted *Cudoniella* SACC. instead of *Haplocybe*, appointing *C. acicularis* (BULL.) SCHROET. as the type.

Thereafter, however, *Leotia marcida* PERS. came to be treated as a slender ochraceous form of *Leotia lubrica*. The second species of SACCARDO's *Cudoniella*, *Cudonia Queleti* FR. came to be considered the same as *Helotium aciculare* (BULL.) PERS., the third species, *Cudonia stagnalis* QUÉL. as a doubtful species, and the fourth species, *Leotia aquatica* LIB.

the same as *Ombrophila Clavus* (A. et S.) CKE.

Consequently, the genus *Cudoniella* is invalid for the Geoglossaceous fungi.

In 1934, the writer reported from Japan two new species of *Cudoniella* of which the generic limitation followed SCHROETER's conception. Resulting from his subsequent studies, however, the writer came to the conclusion that the one species, *C. rutilans* is a species of *Leotia*, and the other, *C. jezoensis*, is a representative of a new genus of the family. The new genus is thus named *Neocudoniella*.

***Neocudoniella jezoensis* (IMAI) IMAI, comb. nov.**

*Cudoniella jezoensis* IMAI, Trans. Sapporo Nat. Hist. Soc. XIII, 181, t. 7, f. 13-17, 1934.  
Nom. jap. *Nise-zukintake*.

Ascomatibus dense gregariis, stipitatis, pileatis, tremelloso-gelatinosis vel gelatinoso-carnosis, albidulis, avellaneis vel brunneolis, 1-4 cm. altis; pileo convexo, albidulo, avellaneo vel brunneolo, glabro, sulcato-rugoso, margine involuto, undulato, 3-10 mm. lato; stipite tereti vel compresso, subaequali vel apice leviter attenuato, raro flexuoso, glabro, non levi, concolori, translucido, 2-3 mm. crasso; ascis cylindraceo-clavatis, apice leviter contractis rotundatisque, poro iodo non caerulescentibus, octosporis, 55-80  $\times$  5-7  $\mu$ ; sporis late ellipsoideis, utrimque obtusis, continuis, hyalinis, levibus, monostichis, 5-6  $\times$  2.5-3  $\mu$ ; paraphysibus filiformibus, hyalinis, apice leviter incrassatis.

Hab. in lignis putridis in silvis, autumnno.

Typus in Herb. IMAI, in Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Sapporo, Prov. Ishikari, Hokkaido, Japonia.

Area distr.: Japonia.

Exempl. invest.:

Hokkaido—Ishikari: Sapporo, Monte Moiwa (K. SASAKI, Oct. 20, 1929).

The present fungus has small spores by which it is allied to *Cudoniella javanica* var. *microspora* PENZ. et SACC. But it is easily distinguished from the latter by the larger fructification.

***Leotia* PERS. ex FR.**

*Leotia* HILL, Hist. Pl. 43, 1751.

*Leotia* PERS. in ROEMER N. Mag. Bot. I, 97, 1794 (sec. DURAND); Comm. Fung. Clav. 31, 1797; Syn. Fung. 611, 1801, pro parte.

*Hygromitra* NEES, Syst. Pilze, 157, 1817.

*Leotia* ? *Cucullaria* PERS. Myc. Eur. I, 201, 1822.

*Leotia* FR. Syst. Myc. II, 29, 1823, pro parte; Syst. Orb. Veg. I, 85, 1825; Summa Veg. Scand. 357, 1849—BERK. in SMITH Engl. Fl. V, 2, 185, 1836; Outl. Brit. Fung. 360, 1860—BONORD. Handb. Allgem. Myk. 207 & 299, 1851—KICKX, Fl. Crypt. Flandr. I, 500, 1867—CKE. Handb. Brit. Fung. 661, 1871; Mycogr. I, 95, 1876, pro parte; Handb. Austr. Fung. 250, 1892—KARST. Myc. Fenn. I, 6, 1871—QUÉL. Champ. Jura Vosg. II, in Mém. Soc. D'Emul. Montb. 2 sér. V, 386, 1873; Ench. Fung. 226, 1886—GILL. Disc. Fr. 23, 1879—SACC. Bot. Centralbl. XVIII, 249, 1884; Syll. Fung. VIII, 609, 1889—BOUD. Bull. Soc. Myc. Fr. I, 110, 1885; Hist. Class. Disc. Eur. 89, 1907—SCHROET. Pilze Schles. II, 20, 1893; in ENGLER & PR. Nat. Pfl. Fam. I, 1, 166, 1894—MASS. Brit. Fung. Fl. IV, 470, 1895; Ann. Bot. XI, 285, 1897, pro parte—REHM, Pilze Deut., Hyst. & Disc. 1164, 1896—UNDERW. Minn. Bot. Stud. I, 484, 1896—DURAND, Ann. Myc. VI, 444, 1908—LLOYD, Geoglossaceae, 15, 1916—LUIJK, Kruidk. Arch. Jaarg. 1918, 138, 1919—BRES. Icon. Myc. XXIV, 119, 1932—S. ITO & IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 146 & 147, 1932—CLEL. Toads. & Mushr. South Austr. 341, 1935—IMAI, Bot. Mag. Tokyo, I, 9, 1936.

*Leotia* ? *Euleotia* PHILLIPS, Brit. Disc. 22, 1887.

Ascoma stipitatum, pileatum, rectum, carnosu-subtremellosum vel tremulo-gelatinosum; pileus convexo-peltatus, convexo-suborbicularis, sulcato-plicatus, margine involutus et undulato-lobatus, supra margineque hymenio persistente obductus, subtus sterilis; stipes teretis vel compressus. Asci clavati, inoperculati, octospori; sporae oblongo-fusiformes, ellipsoideo-oblongae vel raro subcylindratae, primo continuae, dein guttulae, demum 3-5-septatae, hyalinae, leves; paraphyses praesentes, filiformes.

Typus: *Leotia lubrica* [SCOP.] PERS. ex FR.

It seems that the name *Leotia* was first used by HILL, in 1751, but in a non-binomial sense. PERSON established the genus *Leotia* in 1794 with the type species *Leotia lubrica* which had been formerly described by SCOPOLI under the name *Elvela lubrica*. In 1801, he added eight species viz. *Leotia Mitrula*, *L. Ludwigii*, *L. Dicksoni*, *L. Bulliardii*, *L. circinans*, *L. marcida*, *L. conica* and *L. Helvella*. In 1822 he divided the genus into two sections, "Carnosae, colore plerumque flavescentes aut rubicundae" and "Cucullaria. Tremellosae aut carnosu-gelatinosae, terrestres, colore obscuri, fusciscentes olivaceae aut virescentes. Pileo brevi subpatulo." The former section comprised five species *L. circinans*, *L. Mitrula*, *L. truncorum*, *L. Clavus* and *L. uliginosa*, and the latter four species, viz., *L. lubrica*; *L.*

*marcida*, *L. atrovirens* and *L. platypoda*.

In 1823, FRIES described ten species of *Leotia* and divided the genus into two tribes, Cuccullaria and Hygromita. The former tribe was mainly characterized by the fleshy or tough texture which was persistent when dry and by the stuffed or hollow stipe. *Leotia circinans* and four indefinite or doubtful species were included in this tribe.

The latter tribe was characterized as "Substantia tremellosa aut caroso-gelatinosa, putrescens nec persistens Pileus minus evolutus clavato-capitatus, tumens, margine subtus adnato. Stipes saepius fistulosus, gelatina plenus, sursum incrassatus & in pileum abiens. *Noxiae, colore e flavo viridisque variae. Abeunt ad Tremellas mediante Trem. Helv. Decand.; in L. lubrica demum desunt asci,*" citing Tremella Hygromitra NESS (Syst. p. 157) and Cuccullaria PERS. (Myc. Eur. I, p. 201) as synonyms. *Leotia marcida, L. lubrica, L. chlorocephala, L. viscosa* and *L. atrovirens* were included in this tribe.

In 1849, FRIES established the genus *Cudonia* based upon the above mentioned *L. circinans* and *L. marcida*, and placed it in Helvellacei. The genus *Leotia* was characterized by "Gelatina distentae, tremulae; disco pileato primitus convexo immarginato, in ambitu revoluto," including *L. lubrica*, and belonged to Bulgariacei.

Hitherto, the classification of the fungi belonging to this genus has been mainly based on the color, size and form of the ascophore. Several species have been thus established. These fungi are widely variable in their color, size and form even in their living fresh condition according to the locality, habitat and stage of development, and in particular they are extremely variable in color when dried or preserved. Moreover, the microscopic features are considered to be of minor importance for the taxonomy. Therefore the fungus should be studied in the field and in the living, fresh condition, with numerous specimens. The preserved materials should be accompanied by carefully prepared notes regarding the color and form of the living fresh plant.

As a result of the writer's studies with numerous specimens of the fungus in the field as well as with those in fresh condition, he came to the conclusion that it is more reasonable to treat some species of this genus as forms of *L. lubrica* representing respective forms or colors than to recognize them as distinct species.

## Clavis specierum.

1. Pileus flavo-ochraceus, subaurantiacus, flavo-viridis, aeruginosus vel atro-viridis; stipes albidus, luteus, flavus, flavo-viridis, olivaceus vel atro-viridis, plerumque furfuraceus ..... *L. lubrica*.  
 2. Pileus roseus, deinde sanguinescens; stipes rufescens, crasse verrucosus ..... *L. rutilans*.

*Leotia lubrica* [SCOP.] PERS. ex FR.

*Leotia gelatinosa* HILL, Hist. Pl. 43, 1751, non binom. (teste FR.).

*Elvela lubrica* SCOP. Fl. Carn. ed. 2, II, 477, 1772 (teste FR.).

*Helvella gelatinosa* BULL. Champ. Fr. 296, t. 473, f. 2, 1791—Sow. Engl. Fung. t. 70, 1797.

*Leotia lubrica* PERS. in ROEMER N. Mag. Bot. I, 97, 1794 (sec. DURAND); Comm. Fung. Clav. 31, 1797; Syn. Fung. 613, 1801; Myc. Eur. I, 201, 1822.

*Leotia lubrica* FR. Syst. Myc. II, 29, 1823; Summa Veg. Scand. 357, 1849—BERK. in SMITH Engl. Fl. V, 2, 186, 1836; Outl. Brit. Fung. 360, t. 22, f. 1, 1860—KICKX, Fl. Crypt. Flandr. I, 500, 1867—FUCK. Symb. Myc. 284, 1869—CORDIER, Champ. Fr. II, 195, t. 53, f. 2, 1870—CKE. Handb. Brit. Fung. 661, f. 327, 1871; Mycogr. I, 97, t. 44, f. 171, 1876; Handb. Austr. Fung. 251, t. 19, f. 142, 1892—KARST. Myc. Fenn. I, 26, 1871—QUÉL. Champ. Jura Vosg. II, in Mém. Soc. D'Emul. Montb. 2 sér. V, 386, 1873; Ench. Fung. 266, 1886—GILL. Disc. Fr. 23, cum icone, 1879—PHILLIPS, Brit. Disc. 22, 1887—SACC. Syll. Fung. VIII, 609, 1889—MASS. Brit. Fung. Fl. IV, 471, 1895; Ann. Bot. XI, 287, t. 13, f. 61-64, 1897—HONE, Minn. Bot. Stud. III, 317, t. 3, f. 4, t. 5, f. 5-8, 1904—DURAND, Ann. Myc. VI, 446, t. 11, f. 106, t. 20, f. 213, 1908—ROLLAND, Atlas Champ. 99, t. 113, f. 260, 1910—LLOYD, Geoglossaceae, 15, f. 798, 1916—LUIJK, Kruidk. Arch. Jaarg. 1918, 139, f. 11, 1919—BISBY, BULLER & DEARN. Fung. Manitoba, 58, 1929—KAWAM. Jap. Fung. no. 4, 1929—BRES. Icon. Myc. XXIV, t. 1187, 1932—S. ITO & IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932—HEIM, Fungi Iberici, 31, 1934—CLEL. Toads. & Mushr. South Austr. 341, f. 74, 1935—IMAI, Bot. Mag. Tokyo, I, 10, 1936; Ann. Myc. XXXVIII, 277, 1940—MAIRE, Fungi Catal. 24, 1937.

*Leotia gelatinosa* SCHROET. Pilze Schles. II, 20, 1893; in ENGLER & PR. Nat. Pl. Fam. I, 1, 166, f. 140, 1894—REHM, Pilze Deut., Hyst. & D'sc. 1165, cum fig. 1896—KILLERM. Krypt. Forsch. No. 3, 150, 1918—VELEN. Ceske Houby, 884, f. 167-1, 1922.

*Leotia japonica* YASUDA, Bot. Mag. Tokyo, XXX, (394), 1916; Ibid. XXXI, 1, cum fig. 1917.

*Leotia lubrica* f. *typica* IMAI, Bot. Mag. Tokyo, L, 12, 1936.

Nom. jap. *Zukintake*.

Ascomatibus dense gregariis vel subcaespitosis, non-numquam solitariis, stipitatis, pileatis, viscido-gelatinosis, 2-6 cm. longis; pileo tumido, sub-hemisphaerico, rotundato vel convexo, irregulariter lacunoso, margine

involuta obtuso rugosoque, flavo-viridi, 3-15 mm. lato; stipite tereti vel compresso, vulgo sursum leviter attenuato, usque ad 6 cm. longo, minute squamuloso, flavidulo, flavo, flavidulo-ochraceo, ochraceo vel subolivascenscente; ascis clavatis, poro iodo non caerulescentibus, 130-160 × 10-12  $\mu$ , octosporis; sporis sursum distichis, deorsum monostichis, cylindraco-oblongis vel fusoides, utrinque obtusis vel subacutis, rectis vel curvatis, hyalinis, levibus, primo continuis, dein pluriguttulatis, demum 3-7-septatis, 18-28 × 5-6  $\mu$ ; paraphysibus filiformibus, ramosis, apicibus clavatis vel pyriformibus, hyalinis vel viridulis.

Hab. ad terram inter foliis in silvis, aestate—autumno.

Typus in ?Herb. PERSOON.

Loc. typ.: ignota.

Area distr.: Europa, America bor., Australia, Asia orient. (Japonia).

Exempl. invest.:

Hokkaido—Kitami: Notoro (S. IMAI, Sept. 19, 1927); Oketo (S. IMAI, Sept. 20, 1927). Kushiro: Akan (S. IMAI, Sept. 12, 1927; Sept. 15, 1933). Ishikari: Nopporo (S. IMAI, Oct. 7, 21, 1928; Sept. 28, Nov. 9, 1930; Oct. 4, 11, 1931; Oct. 2, 1932; Sept. 1, 1935); Monte Soranuma (S. IMAI, Sept. 19, 1930; T. KONNO, Sept. 13, 1939); Monte Teine (Y. TOKUNAGA, Sept. 29, 1929). Ihuri: Shikotsu (S. IMAI, Sept. 8, 1931; Sept. 15, 1934; Sept. 9, 1935); Tôya (Y. TOCHINAI, Sept. 27, 1932). Oshima: Ôno-mura (S. IMAI, Sept. 21, 1935); Shiriuchi (S. IMAI, Nov. 1, 1933).

Honshû—Mutsu: Sukayu (S. IMAI, Sept. 23, 1935; Sept. 17, 1937); Towada-mura (S. IMAI, Sept. 25, 26, 1935; Sept. 20, 1937). Uzen: Monte Nishiazuma (S. IMAI, Oct. 8, 1935). Rikuzen: Sendai (A. YASUDA, Sept. 9, 1914; Typus *L. japonicae*, in Herb. YASUDA, in Tokyo Sci. Mus.). Kôzuke: Kusatsu (S. IMAI, Aug. 29, 1938). Shimotsuke: Nikkô, Ogura-yama (S. IMAI, Oct. 23, 1936); Nikkô, Chûgûji (S. IMAI, Oct. 10, 1937). Hitachi: Fukuroda-mura (S. IMAI, Oct. 11, 1937). Shinano: Monte Kurohime (S. IMAI, Sept. 4, 1938); Azumi-mura (S. IMAI, Sept. 10, 12, 1938). Kai: Nishinoumi-mura (S. IMAI, Oct. 4, 1940). Musashi: Asakawa (S. IMAI, Oct. 25, 1936). Kii: Tanabe (K. MINAKATA, Sept. 18, 1909, ex Herb. MINAKATA).

The present fungus is equivalent to f. *typica* IMAI in the writer's previous paper, and it is characterized by the yellow or ochraceous or greenish-yellow pileus and yellow stipe.

Some of the authors above cited, have given the following measurements of the asci and spores for this species:

KARSTEN (1871)	asci 140-155 × 10-12 μ; spores 20-26 × 4-6 μ.
SACCARDO (1889)	asci 90 × 12 μ; spores 18-24 × 5 μ.
SCHROETER (1893)	asci 120-150 × 8-12 μ; spores 17-20 × 4-5 μ.
REHM (1896)	asci 90-200 × 10-12 μ; spores 18-25 × 5-6 μ.
MASSEE (1897)	asci 150-200 × 10-12 μ; spores 19-27 × 5-6 μ.
DURAND (1908)	asci 130-160 × 10-12 μ; spores 18-28(20-23) × 5-6 μ.
LUIJK (1919)	asci 90-200 × 9-12 μ; spores 17-28 × 4-6 μ.
BRESADOLA (1932)	asci 150-200 × 10-14 μ; spores 15-25 × 6-7 μ.

The writer has recognized the following eleven forms in this species:

***L. lubrica* f. *gigantea* IMAI, form. nov.**

*Leotia lubrica* Auct. pro parte.

Nom. jap. *Ô-zukintake*.

Ascomatibus maximis; pileo flavo-viridi, 1.5-2.5 cm. in diam.; stipite flavo 6-8 cm. et ultra longo et usque ad 1 cm. crasso; cetera ut in f. typica.

Hab. ad terram inter foliis in silvis, autumnò.

Typus in Herb. IMAI, Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Nikko, Prov. Shimotsuke, Honshû, Japonia.

Area distr.: Asia orient. (Japonia), Europa.

Exempl. invest.:

Honshû—Shimotsuke: Nikkô, Chûgûji (S. IMAI, Oct. 10, 1937).

***L. lubrica* f. *ochracea* IMAI, form. nov.**

?*Leotia lubrica* (non FR.) MURRILL, Mycologia, II, 1, t. 17, f. 1, 1910.

Nom. jap. *Ki-zukintake*.

Ascomatibus magnis, ochraceis vel aurantio-ochraceis, tinctura aeruginosa vel olivacea viridive non suffusis; cetera ut in f. typica.

Hab. ad terram in silvis, autumnò.

Typus in Herb. IMAI, Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Sukayu, Prov. Mutsu, Honshû, Japonia.

Area distr.: Japonia, ? America borealis.

Exempl. invest.:

Honshû—Mutsu: Sukayu (S. IMAI, Sept. 17, 1937). Uzen: Monte Nishiazuma (S. IMAI, Sept. 30, 1937). Shimotsuke: Oku-nikkô (S. IMAI, Oct. 7, 9, 1937). Kôzuke: Katashina-mura (S. IMAI, Oct. 4, 1937).

***L. lubrica* f. *anthocephala*** IMAI et MINAKATA

*Leotia lubrica* f. *anthocephala* IMAI et MINAKATA, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932, nom. nud.; IMAI, Bot. Mag. Tokyo, L, 13, 1936.

Nom. jap. *Hana-zukintake*.

Ascomatibus plerumque magnis; pileo obscure aurantiaco; stipite pallide verdigris-luteo vel sordide verdigris-viridi; cetera ut in f. typica.

Hab. ad terram in muscosis, autumno.

Typus in Herb. IMAI, Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Tanabe, Prov. Kii, Honshû, Japonia.

Area distr.: Japonia.

Exempl. invest.:

Honshû—Kii: Tanabe (K. MINAKATA, Oct. 15, 1909, ex Herb. MINAKATA).

***L. lubrica* f. *Towadensis*** IMAI, form. nov.

Nom. jap. *Towada-zukintake*.

Ascomatibus magnis; pileo pallide olivaceo; stipite viridulo; cetera ut in f. typica.

Hab. ad terram in silvis, autumno.

Typus in Herb. IMAI, Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Towada-mura, Prov. Mutsu, Honshû, Japonia.

Area distr.: Japonia.

Exempl. invest.:

Honshû—Mutsu: Towada-mura (S. IMAI, Sept. 21, 1937).

***L. lubrica* f. *viscosa*** IMAI, emend.

*Tremella stipitata* BOSC, Ges. Nat. Freunde Berlin Mag. V, 89, t. 6, f. 14, 1811.

*Hygromitra stipitata* NEES, Syst. Pilze, 157, t. 15, f. 144, 1817.

*Leotia viscosa* FR. Syst. Myc. II, 30, 1823—SACC. Syll. Fung. VIII, 610, 1889.

*Leotia stipitata* SCHROET. in ENGLER & PR. Nat. Pil. Fam. I, 1, 166, 1894—SEEVER, Bull. Lab. Nat. Hist. State Univ. Iowa, V, 252, t. 1, f. 2, 1904—DURAND, Ann. Myc. VI, 449, 1908, pro parte—MURRILL, Mycologia, II, 2 (pro parte), t. 17, f. 2, 1910—MANS, Papers Mich. Acad. Sci. XX, 82, 1935—POVAH, Papers Mich. Acad. Sci. XX, 132, 1935.

?*Leotia lubrica* f. *stipitata* MASS. Ann. Bot. XI, 290, t. 13, f. 65, 1897.

*Leotia lubrica* f. *viscosa* IMAI, Bot. Mag. Tokyo, L, 13, 1936, pro parte.

*Leotia lubrica* f. *aurantipes* IMAI, Ibid. 13, 1936.

Nom. jap. *Aka-e-no-zukintake*.

Ascomatibus magnis; pileo olivaceo vel viridi atro-viridive; stipite luteo, flavo vel aurantiaco; cetera ut in f. typica.

Hab. ad terram in silvis inter foliis, autumno.

Typus in Herb. FRIES, Uppsala.

Loc. typ.: ignota.

Area distr.: Europa, America bor., Asia orient. (Japonia).

Exempl. invest.:

Hokkaido—Ishikari: Nopporo (S. IMAI, Sept. 25, Oct. 7, 1927; Sept. 28, 1930; Oct. 1938); Jôzankei (S. IMAI, Sept. 24, 1926); Monte Soranuma (S. IMAI, Sept. 19, 1930). Oshima: Ôno-mura (S. IMAI, Oct. 21, 1935).

Honshû—Mutsu: Towada-mura (S. IMAI, Sept. 25, 27, 1935; Sept. 21, 1937). Uzen: Monte Nishiazuma (S. IMAI, Sept. 30, 1937). Kôzuke: Kusatsu (S. IMAI, Aug. 29, 1938). Shinano: Azumi-mura (S. IMAI, Sept. 12, 1938). Kai: Masutomi-mura (S. IMAI, Sept. 26, 1940); Narusawa-mura (S. IMAI, Oct. 9, 1940); Kamikuisshiki-mura, Motosu (S. IMAI, Oct. 1, 1940). Hida: Hirayu (S. IMAI, Sept. 8, 1938). Kii: Nachi (H. IWATSU, Oct. 17, 1903, ex Herb. MINAKATA).

Kyûshû—Hyûga: Sunoura (S. IMAI, Oct. 20, 1939).

*Leotia viscosa* of FRIES was based upon *Tremella stipitata* BOSC and *Hygromitra stipitata* NEES, of which the stipe was golden-yellow or yellow and never white. In this paper the writer confines the present form to the fungus which has a dark green pileus and yellow or golden-yellow or orange-yellow stipe. Accordingly f. *aurantipes* belongs here. The fungus having a white stipe is treated as a distinct form and newly named f. *Kawamurae*.

***L. lubrica* f. *Kawamurae* IMAI, form. nov.**

*Leotia stipitata* (non SCHROET.) DURAND, Ann. Myc. VI, 449, 1908, pro parte.

*Leotia chlorocephala* (non SCHW. nec FR.) KAWAMURA, Jap. Fung. no. 146, 1929.

*Leotia lubrica* f. *viscosa* IMAI, Bot. Mag. Tokyo, L, 13, 1936, pro parte.

*Leotia lubrica* f. *Stevensoni* (non MASS. nec DURAND) IMAI, Ibid. 13, 1936.

Nom. Jap. *Ao-gashira-zukintake*.

Ascomatibus magnis; pileo atro-viridi stipitique albo; cetera ut in f. typica.

Hab. ad terram in silvis, aestate—autumno.

Typus in Herb. IMAI, Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Sapporo, Prov. Ishikari, Hokkaido, Japonia.

Area distr.: Asia orient. (Japonia), America borealis.

Exempl. invest.:

Hokkaido—Ishikari: Sapporo (Y. GONDO, Jul. 17, 1932).

Honshû—[Shinano: Karuisawa, sec. KAWAMURA]. Kii: Nachi (K. MINAKATA, Nov. 25, 1903, ex. Herb. MINAKATA).

***L. lubrica* f. *chlorocephala* MASS.**

?*Leotia chlorocephala* SCHW. Trans. Soc. Nat. Cur. Lips. 1822, 88.

?*Leotia chlorocephala* FR. Syst. Myc. II, 30, 1923.

*Leotia chlorocephala* CKE. Mycogr. I, 98, t. 44, f. 174, 1876—PHILLIPS, Brit. Disc. 23, 1887—MASS. Brit. Fung. Fl. IV, 471, 1895—DURAND, Ann. Myc. VI, 450, t. II, f. 110, t. 20, f. 211-212, 1908—MURRILL, Mycologia, II, 2 (pro parte), t. 17, f. 3, 1910—MAINS, Papers Mich. Acad. Sci. XX, 82, 1935.

***Leotia lubrica* f. *chlorocephala* MASS.** Ann. Bot. XI, 290, 1897.

*Leotia atrovirens* (non PERS. nec FR.) LLOYD, Geoglossaceae, 16, 1916.

*Leotia lubrica* f. *chlorosoma* IMAI, Bot. Mag. Tokyo, I., 14, 1936.

Nom. jap. *Ao-zukintake*.

Ascomatibus magnis; pileo atro-viridi stipiteque verdigris-viridi; cetera ut in f. typica.

Hab. ad terram in silvis, autumnno.

Typus in Herb. Kew, Anglia.

Loc. typ.: ignota.

Area distr.: Europa, America bor. et austr., Asia orient. (Japonia)..

Exempl. invest.:

Hokkaido—Iburi: Shikotsu (S. IMAI, Sept. 18, 1931).

Honshû—Kii: Shimoakitsu-mura (H. KUSAMOTO, ex Herb. MINAKATA); Iwata-mura (H. HIRATA, Nov. 17, 1931). Yamashiro: Daigo (S. AKAI, Sept. 8, 1935, in Herb. HEMMI, Univ. Imp. Kyoto).

*Leotia chlorocephala* of SCHWEINITZ could not be definitely identified with any species known at the present time. SCHWEINITZ described the pileus as green, but as to the stipe mentioned only that it is always covered with aeruginous powders, and no other general colors were given. FRIES mainly followed SCHWEINITZ's description for his *Leotia chlorocephala*. Therefore, the name *L. chlorocephala* has been adopted by some for a fungus

having green-colored pileus and whitish or yellowish stipe, and by others for an entirely green-colored fungus. The latter is the *L. chlorocephala* of DURAND who studied the specimens of SCHWEINITZ in the SCHWEINITZ Herbarium in Philadelphia and likewise in the CURTIS, FRIES and BERKELEY Herbaria. SEAVER, in 1904, treated the *L. chlorocephala* of FRIES in 1823, that of BERKELEY in Grevillea, Vol. 3, that of PHILLIPS in 1887, that of SACCARDO in Sylloge, and that of UNDERWOOD in 1896, as the synonym of *L. stipitata* (BOSC) SCHROET.

The writer, in his previous paper, proposed the new form name, *chlorosoma* for the entirely green-colored fungus discarding *L. chlorocephala* which was only imperfectly described, but MASSEE's form name is earlier and valid for this fungus.

***L. lubrica* f. *portentosa* IMAI et MINAKATA**

*Leotia lubrica* f. *portentosa* IMAI et MINAKATA, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932, nom. nud.; IMAI, Bot. Mag. Tokyo, L, 14, 1936.

Nom. jap. *Yabure-zukintake*.

Ascomatibus magnis, ramoso-lobatis; lobis subcoralloideis, subtuberculosis, apicibus subcapitatis sporiferis atro-subcyaneo-viridis; stipite elongato, erecto, curvato vel contorto, supra basi plerumque inflato, pallide verdigris-viridi, furfuraceo-punctato; cetera ut in f. typica.

Hab. ad terram glareosam in foliis, hiemi.

Typus in Herb. IMAI, Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Ôshima, Prov. Kii, Honshû, Japonia.

Area distr.: Japonia.

Exempl. invest.:

Honshû—Kii: Ôshima (K. MINAKATA, Dec. 4, 1902, ex Herb. MINAKATA).

***L. lubrica* f. *minima* IMAI**

*Leotia lubrica* f. *minima* IMAI, Bot. Mag. Tokyo, L, 15, 1936.

Nom. jap. *Hime-zukintake*.

Ascomatibus parvis, vix ultra 1.5 cm. altis, flavo-ochraceis; cetera ut in f. typica.

Hab. ad terram, autumnno.

Typus in Herb. IMAI, Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Nopporo, Prov. Ishikari, Hokkaido, Japonia.

Area distr.: Japonia.

Exempl. invest.:

Hokkaido—Ishikari: Nopporo (S. IMAI, Sept. 18, 1932; Sept. 1, 1935); Monte Taisetsu (S. IMAI, Sept. 5, 1940). Iburi: Shikotsu (S. IMAI, Sept. 5, 1934; Sept. 9, 1935). Oshima: Ôno-mura (S. IMAI, Sept. 21, 1935).

Honshû—Mutsu: Sukayu (S. IMAI, Sept. 17, 1937); Towada-mura (S. IMAI, Sept. 26, 1935). Ugo: Akita, Nibetsu (S. IMAI, Oct. 4, 1935). Shimotsuke: Nikkô, Ogura-yama (S. IMAI, Oct. 23, 1936); Nikkô, Chûgûji (S. IMAI, Oct. 10, 1937); Oku-nikkô (S. IMAI, Oct. 7, 1937). Shinano: Azumi-mura (S. IMAI, Sept. 12, 1938).

***L. lubrica* f. *parviaurantipes* IMAI, form. nov.**

Nom. jap. *Hime-akaeno-zukintake*.

Ascomatibus parvis, vix ultra 1.5 cm. altis; pileo olivaceo, atro-olivaceo, viridi vel atro-viridi; stipite flavo vel aurantiaco; cetera ut in f. typica.

Hab. ad terram in silvis, autumnno.

Typus in Herb. IMAI, Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Monte Hakkôda, Prov. Mutsu, Honshu, Japonia.

Exempl. invest.:

Honshû—Mutsu: Monte Hakkôda (S. IMAI, Sept. 19, 1937). Kai: Nishinoumi-mura (S. IMAI, Oct. 4, 1940).

The present form is equivalent with f. *viscosa* of the larger group, but is placed in the smaller group.

***L. lubrica* f. *atro-virens* (PERS. ex FR.) IMAI**

*Leotia atro-virens* PERS. Myc. Eur. I, 202, t. 9, f. 1-3, 1822.

*Leotia atro-virens* FR. Syst. Myc. II, 20, 1823—FUCK. Symb. Myc. 284, 1869—CKE. Mycogr. I, 219, t. 102, f. 368, 1879—QUÉL. Champ. Jura Vosg. II, in Mém. Soc. D'Emul. Montb. 2 sér. V, 386, 1873; Ench. Fung. 267, 1886—GILL. Disc. Fr. 23, 1879—SACC. Syll. Fung. VIII, 610, 1889—REHM, Pilze Deut., Hyst. & Disc. 1166, 1896—VELEN. Ceske Houby, 884, f. 167-2, 1922.

?*Leotia Stevensoni* BERK. et BR. Ann. Mag. Nat. Hist. 5 ser. III, 212, 1879.

?*Leotia chlorocephala* f. *Stevensoni* BERK. in PHILLIPS, Brit. Disc. 24, 1887—MASS. Brit. Fung. Fl. IV, 472, 1895.

?*Leotia chlorocephala* var. *Stevensoni* SACC. Syll. Fung. VIII, 610, 1889.

?*Leotia lubrica* f. *Stevensoni* MASS. Ann. Bot. XI, 289, 1897.

*Leotia lubrica* f. *atrovirens* IMAI, Bot. Mag. Tokyo, L, 15, 1936.

Nom. jap. *Hime-ao-zukintake*.

Ascomatibus parvis, vix ultra 1.5 cm. altis, atro-virentibus; cetera ut in f. typica.

Hab. ad terram in silvis, autumno.

Typus in ?Herb. PERSON, in Rijks Herb., Leiden.

Loc. typ.: in Vogesia, Gallia.

Area distr.: Europa, Asia orient. (Japonia).

Exempl. invest.:

Honshû—Yamashiro: Kyoto (K. MATSUO, Oct. 9, 1929, ex Herb. IEMMI, in Univ. Imp. Kyoto). Tanba: Chii-mura (S. IMAI, Oct. 10, 1941).

*Leotia atrovirens* has been accepted by many authors as a distinct species having entirely green-colored minor fructification.

According to DURAND, BOUDIER, who had collected what he believed to be *L. atrovirens* in France and illustrated it in COOKE's Mycographia, pointed out that his *L. atrovirens* was clearly different from DURAND's *L. chlorocephala* of which the paraphyses were piriform above, and branching below, while those of BOUDIER's fungus branched near the clavate apices.

PERSON, who first described *L. atrovirens*, illustrated six individuals of ascophores which were less than 1.5 cm. in length, and FRIES, examining the PERSON specimen, additionally noted that the fungus was hardly up to  $\frac{1}{2}$  inch in length.

Although the writer has not observed the fact pointed out by BOUDIER, he proposes to adopt the name *L. atrovirens* giving it form rank for the green minor form and to separate it from the larger green form which is named *chlorocephala* in this paper and was formerly named *chlorosoma*.

In his previous paper, the writer reported *L. lubrica* f. *Stevensoni* in the sense of DURAND from Japan. However, *Leotia Stevensoni* of BERKELEY and BROOME is a small dark green-colored fungus said by the authors to approach *L. atrovirens* from which it does not appear to possess any decided difference in ascophore. Consequently it is probably the same as *L. atrovirens*, or if it is not exactly so, at least it is a smaller specimen of f. *chlorocephala*. In this paper the writer includes the species in the form *atrovirens* with some question.

***Leotia rutilans*** (IMAI et MINAK.) IMAI, comb. nov.

*Cudoniella rutilans* IMAI et MINAKATA, Trans. Sapporo Nat. Hist. Soc. XIII, 181, t. 7, f. 18-22, 1934.

Nom. jap. *Aka-zukintake*.

Ascomatibus gregariis, non-numquam caespitosis, stipitatis, pileatis, gelatinoso-ceraceis, 1-4 cm. altis; pileo convexo, irregulariter formi vel pulvinoscente, uvido, minute papilloso, saepe fisso, roseo, deinde sanguinescente, margine obtuso, aliquantulum strigoso, 1-10 mm. lato; stipite subaequali vel basi attenuato, 1-3 cm. longo, 1-5 mm. crasso, uvido, subtranslucido, succineo, rufescente, crasse verrucoso; ascis cylindraceo-clavatis, apice rotundatis, iodo non caerulescentibus, octosporis,  $100-125 \times 7.5-12.5 \mu$ : sporis monostichis vel distichis, ellipsoideis vel subfusiformibus, rectis vel subventricosis, hyalinis, continuis,  $15-22.5 \times 5 \mu$ ; paraphysibus filiformibus, circa  $2.5 \mu$  crassis, ramosis, apice non vel vix incrassatis, curvatis vel leviter uncinatis, brunneolis.

Hab. ad terram muscosam in silvis, aestate—autumno.

Typus in Herb. IMAI, in Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Inari-mura, Prov. Kii, Honshû, Japonia.

Area distr.: Japonia.

Exempl. invest.:

Honshû—Kii: Inari-mura, Isaida (K. MINAKATA, Jul. 6, Aug. 5, 1909, ex Herb. MINAKATA).

The fungus is easily distinguished from others by its color of ascophore, and the rough stipe with coarse obtuse warts, and especially from the lubrica group by the character of paraphyses.

The collector, Mr. MINAKATA, observed 1 or 2 guttulations in the spores in the fresh condition, but the writer could not observe such guttulation, nor septation, but granular contents in the dried specimens.

***Sarcoleotia*** S. ITO et IMAI

*Sarcoleotia* S. ITO et IMAI, Trans. Sapporo Nat. Hist. Soc. XIII, 182, 1934.

Ascoma carnosum, pileatum, stipitatum, rectum; pileus convexus; stipes gracilis et brevis. Ascii clavati, inoperculati, octospori; sporae in cumulo roseae, hyalinae, subcylindraceae vel subclavato-cylindraceae, longe continuatae, demum uni-septatae; paraphyses praesentes, filiformes.

Typus: *Sarcoleotia nigra* S. ITO et IMAI.

Etym.: sarx + *Leotia*.

The type species of this genus was first classified as *Leotia* in the writer's first paper published in 1932. After thorough investigation and comparison with many of the other species of *Leotia*, it seems best now to found a new genus, laying stress on the fleshy nature of the ascophores and the subcylindrical spores which are pink colored in mass, while the members of *Leotia* have gelatinous ascophores and hyaline oblong-fusiform spores.

***Sarcoleotia nigra* S. ITO et IMAI**

*Leotia nigra* S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932, nom. nud.

***Sarcoleotia nigra*** S. ITO et IMAI, Trans. Sapporo Nat. Hist. Soc. XIII, 182, t. 7, f. 23-27, 1934.

Nom. jap. *Kuro-zukintake*.

Ascomatibus gregariis, pileatis, stipitatis, carnosis, atris, 8-20 mm. altis; pileo convexo, hemisphaerico, 6-12 mm. lato, atro, margine valde incurvato, libero, rugoso vel noduloso, atro-purpureo; hymenio levi vel rugoso glabro; inferne avellaneo furfuraceo; stipite aequali vel deorsum leviter attenuato, 6-16 mm. longo, 1-3.5 mm. crasso, umbrino vel fuligineo, basi subalbido, leviter furfuraceo: ascis clavatis, apice contractis, poro iodo non caerulescentibus,  $115-155 \times 10 \mu$ , octosporis; sporis distichis, in cumulo roseis, hyalinis, subcylindraceis vel subclavato-cylindraceis, obtusis vel vix acutis, longe continuis, demum uniseptatis,  $22.5-35 \times 5 \mu$ ; paraphysibus filiformibus, ramosis, apice non crassis, brunneolis.

Hab. ad terram in silvis, in montanis alpinis, autumno.

Typus in Herb. IMAI, Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Monte Meakan, Prov. Kushiro, Hokkaido, Japonia.

Area distr.: Japonia.

Exempl. invest.:

Hokkaido—Kushiro: Monte Meakan (S. IMAI, Sept. 13, 1927; Sept. 15, 1933; Sept. 21, 1934; E. HOMMA, Sept. 25, 1935).

Trib. **Cudonieae** (KARST. p. p.) IMAI, trib. nov.

*Cudonieae* (ut Subfam.) KARST. Myc. Fenn. I, 5, 1871, pro parte—DURAND, Ann. Myc. VI, 397, 1908, pro parte.

Sporae aciculares vel clavato-filiformes, demum multiseptatae; cetera ut in Subfamilia.

Typus: *Cudonia* FR.

### *Cudonia* FR.

*Leotia* Aust. vetust. pro parte.

*Cudonia* FR. Summa Veg. Scand. 348, 1849—KARST. Myc. Fenn. I, 5, 1871—QUÉL. Champ. Jura Vosg. II, in Mém. Soc. D'Emul. Montb. 2 sér. V, 386, 1893, pro parte; Ench. Fung. 267, 1886, pro parte—GILL. Disc. Fr. 22, 1879—SACC. Bot. Centralbl. XVIII, 214, 1884; Syll. Fung. VIII, 50, 1889—BOUD. Bull. Soc. Myc. Fr. I, 111, 1885; Hist. Class. Disc. Eur. 89, 1907—SCHROET. Pilze Schles. II, 21, 1893; in ENGLER & PR. Nat. Pfl. Fam. I, 1, 167, 1894—MASS. Brit. Fung. Fl. IV, 472, 1895—REHM, Pilze Deut., Hyst. & Disc. 1169, 1896—DURAND, Ann. Myc. VI, 458, 1908—BRES. Icon. Myc. XXIV, 120, 1932—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 146 & 147, 1932—IMAI, Bot. Mag. Tokyo, L, 671, 1936.

*Leotia* Subg. *Cudonia* CKE, Mycogr. I, 249, 1879—PHILLIPS, Brit. Disc. 22, 1887.

*Vibrissea* (non FR.) MASS. Ann. Bot. XI, 259, 1897, pro parte.

Ascoma pileatum, stipitatum, rectum, carnosum, terrestri; pileus convexo-peltatus, varie sulcato-plicatus, supra ascigerens, subtus sterilis, margine liber et involutus. Asci clavati, inoperculati, octospori; sporae aciculares, aciculari-clavatae vel clavato-filiformes, hyalinae, multiseriatae vel fasciculatae, primo continuae, demum multiseptatae; paraphyses praesentes, filiformes, apicibus flexuoso-subcircinatae.

Typus: *Leotia circinans* PERS. ex FR.

The genus *Cudonia* was established by FRIES in 1849 based upon *Leotia circinans*, and he gave its diagnosis as "Discus carnosus, peltatus, laevis, margine revolutus." Since that time, about twelve species have been reported by various authors. Among them, six species, containing two synonymous species, have been recorded from Japan by A. YASUDA, C. G. LLOYD and the present writer; five species have been reported from North America by PECK, HARKNESS and MAINS, and three from Europe by FRIES, BRESADOLA and P. HENNINGS.

### Clavis sectionum et specierum.

- I. Pileus depresso-convexus, substratoformis, helvelloideus vel irregulariter formis, subtenuis vel tenuis ..... Sect. Eucudonia.
  - A. Ascoma gregarium, non dense caespitosum.

1. Pileus e pallido lutescenti-incarnatove subcinnamomeus; stipes supra subconcolorus basi castaneo-rufus; sporae 30-45  $\mu$  longae ..... *C. circinans*.
2. Pileus flavus vel ochraceus; stipes subconcolorus; sporae 65-85  $\mu$  longae ... *C. japonica*.
- B. Ascoma vulgo dense caespitosum; pileus e pallide flavidulo pallide isabellinus; stipes subconcolorus; sporae 48-60  $\mu$  longae ..... *C. helvelloides*.
- II. Pileus convexo-hemiglobosus vel depresso-convexus, crassus et obesus ..... Sect. Pachycudonia.
  - A. Ascoma gregarium vel subcaespitosum; pileus flavidulus, pallide isabellinus vel subochraceus; stipes subconcolorus; sporae 20-27.5  $\mu$  longae, medio constrictae ... *C. constrictospora*.

Sect. **Eucudonia** IMAI

**Cudonia** Sect. **Eucudonia** IMAI, Bot. Mag. Tokyo, L, 671, 1936.

Pileus depresso-convexus, substratoformis, helvelloideus vel irregulariter formis, subtenuis vel tenuis.

Typus: *Cudonia circinans* (PERS. ex FR.) FR.

**Cudonia circinans** (PERS. ex FR.) FR. sensu BRESADOLA

*Leotia circinans* PERS. Comm. Fung. Clav. 31, 1797; Icon. & Descr. 16, t. 5, f. 5-7, 1798; Syn. Fung. 612, 1801; Myc. Eur. I, 198, 1822.

*Helotium circinans* SWARTZ, Vet. Ak. Handl. 1812, 15.

*Helvella revoluta* WAHLB. Fl. Upsal. 464, 1820.

*Leotia circinans* \* *gracilis* PERS. Myc. Eur. I, 198, 1822—FR. Elench. Fung. II, 3, 1828.

*Leotia circinans* FR. Syst. Myc. II, 27, 1823—RABENH. Deut. Krypt. Fl. I, 377, 1844.

**Cudonia circinans** FR. Summa Veg. Scand. 348, 1849—FUCK. Symb. Myc. 332, 1869—KARST. Myc. Fenn. I, 25, 1871—QUÉL. Champ. Jura Vosg. II, in Mém. Soc. D'Emul. Montb. 2 sér. V, 386, 1873—SACC. Syll. Fung. VIII, 50, 1889—SCHROET. Pilze Schles. II, 21, 1893; in ENGLER & PR. Nat. Pfl. Fam. I, 1, 167, 1894—REHM, Pilze Deut., Hyst. & Disc. 1169, cum fig. 1896—UNDERW. Minn. Bot. Stud. I, 499, 1896—HONE, Minn. Bot. Stud. III, 318, t. 3, f. 3, t. 5, f. 9-12, 1904—DURAND, Ann. Myc. VI, 458, t. 11, f. 103, t. 21, f. 214-215, 1908—LIND, Dan. Fung. 91, 1913—YASUDA, Bot. Mag. Tokyo, XXIX, (60), 1915—LLOYD, Geoglossaceae, 17, f. 800, 1916—KILLERM. Krypt. Forsch. No. 3, 150, 1918—KAUFFM. Papers Mich. Acad. Sci. I, 104, 1923—BRES. Icon. Myc. XXIV, t. 1188, 1932—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932—POVAH, Papers Mich. Acad. Sci. XX, 132, 1935—IMAI, Bot. Mag. Tokyo, L, 671, 1936; Ann. Myc. XXXVIII, 278, 1940—KOBAYASI, Nippon Inkwas. Dukan, 305, t. 143, f. 5-6, 1939—WEHM. Canad. Journ. Research, XVIII, 539, 1940.

*Vibrissea circinans* HAZSL. M. T. Acad. ért. A. Termés. Kor. XI, - (9), 1881 (sec. DURAND).

Nom. jap. *Hotei-take*.

Ascomatibus gregariis, subcaespitosis vel solitariis, carnosis, sicco ceraceis, pileatis, stipitatis, 2-6 cm. longis; pileo 0.5-2 cm. lato, subgloboso vel convexo-subhemisphaerico, centro saepe depresso, margine involuto, e levi ruguloso, e pallido lutescenti-incarnatove subcinnamomeo, subtus plicato et nervis in stipitem decurrentibus; stipite 3-5 cm. longo, sursum attenuato basi incrassato, 3-7 mm. crasso, pileo subconcolori vel pallido vel basi castaneo-rufa fuliginescenteve, teretiusculo, passim flexuoso, compresso, subpulverulenti, subfistuloso; ascis clavatis, apice contractis, basi attenuato-pedicellatis, poro iodo non caerulescentibus, octosporis,  $80-130 \times 7.5-10 \mu$ ; sporis clavato-filiformibus vel aciculari-clavatis, fasciculatis, hyalinis, pluriguttulatis dein pluriseptatis,  $30-45 \times 2-2.5 \mu$ ; paraphysibus filiformibus, ascos parum superantibus, apice valde curvatis vel circinatis, non vel leviter incrassatis, hyalinis.

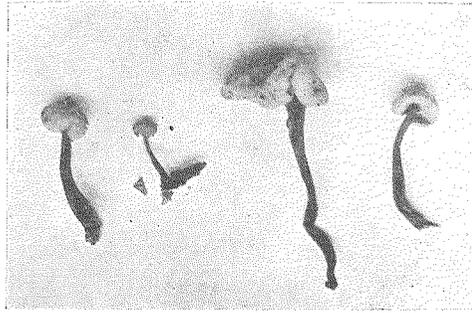


Fig. 4.

*Culomia circinans* (Specimina in Prov. Kôzuke).

Hab. ad humum in silvis abiegnis colliculosis muscosis, aestate—autumno.

Typus in Herb. PERSON, Leiden.

Loc. typ.: ignota.

Area distr.: Europa, America bor., Asia orient. (Japonia).

Exempl. invest.:

Karafuto—Monte Kashipo (Y. TOKUNAGA, Sept. 9, 1929).

Hokkaido—Kitami: Oketo (S. IMAI, Sept. 19, 1933). Ishikari: Monte Taisetsu (S. IMAI, Sept. 5, 1934; Sept. 13, 1939); Monte Soranuma (S. IMAI, Sept. 19, 1930). Iburi: Shikotsu (S. IMAI, Sept. 18, 1931).

Honshû—Kôzuke: Katashina-mura (S. IMAI, Oct. 5, 1937); Okutone (H. HARA, Oct. 1932).

The present fungus is rather easily distinguished by the clavate-filiform spores measuring 30-50  $\mu$  long by 2-3  $\mu$  thick. It is widely distributed in the Northern Hemisphere.

The measurements of the asci and spores given by various authors are as follows:

KARSTEN (1871)	asci 120-140 $\times$ 12 $\mu$ ;	spores 34-40 $\times$ 2 $\mu$ .
SCHROETER (1893)	asci 100-130 $\times$ 9-11 $\mu$ ;	spores 35-40 $\times$ 2 $\mu$ .
REHM (1896)	asci 150-200 $\times$ 10-12 $\mu$ ;	spores 35-45 $\times$ 2 $\mu$ .
DURAND (1908)	asci 85-130(100-115) $\times$ 8-10 $\mu$ ;	spores 30-45(34-40) $\times$ 2 $\mu$ .
"	for PERSOON's type,	spores 30-43 $\mu$ long.
BRESADOLA (1932)	asci 110-130 $\times$ 8-12 $\mu$ ;	spores 36-45 $\times$ 2-3 $\mu$ .

COOKE, in his *Mycographia*, illustrated an obese fungus of this species and gave the measurement of 50-60  $\mu$  long for the spores. MASSEE also repeated this number. As far as COOKE's illustration and the spore-size is concerned, their fungus is not exactly identical with the present one.

In Europe it is rather confused with *C. confusa* BRES., which is said to be more densely gregarious, with minor ascophores, and more rich in color when young than the present species, and also the spores are attenuated at both ends.

### *Cudonia japonica* YASUDA

*Cudonia japonica* YASUDA, Bot. Mag. Tokyo, XXIX, 69 & (192), 1915—LLOYD, Geoglossaceae, 17, t. 801-802, 1916—TROTT. in SACC. Syll. Fung. XXIV, 1157, 1928—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932—IMAI, Bot. Mag. Tokyo, L, 673, 1936.

*Cudonia orientalis* YASUDA, in LLOYD, Geoglossaceae, 18, 1916—TROTT. in SACC. Syll. Fung. XXIV, 1158, 1928—S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932—IMAI, Bot. Mag. Tokyo, L, 674, 1936—MAINS, Amer. Journ. Bot. XXVII, 323, f. 3-4, 1940.

*Cudonia convoluta* YASUDA, in LLOYD, Ibid. 18, f. 803-805, 1916—TROTT. Ibid. XXIV, 1157, 1928—S. ITO et IMAI, Ibid. 148, 1932—IMAI, Ibid. L, 674, 1936—MAINS, Ibid. XXVII, 323, 1940.

Nom. jap. *Gongentaké*.

Ascomatibus gregariis vel subcaespitosis, pileatis, stipitatis, carnisosis, 2.5-7 cm. longis; pileo tenui, helvelloideo, triangulari vel irregulariter convexo, margine involuto, flavidulo, flavo, ochraceo vel brunneo, ruguloso, 1-3.5 cm. lato, subtus albo, radiale rugoso, nervis in stipitem decurrentibus, flocculoso; stipite 2.5-6.5 cm. longo, 2-9 mm. crasso, tereti, saepe compresso, subconcolori vel obscuriori, furfuraceo, superne longitudinaliter rugoso; ascis

clavatis, apice contractis, poro iodo non caerulescentibus, octosporis,  $110-176 \times 10-15 \mu$ ; sporis clavato-filiformibus vel acicularibus, hyalinis, multi-septatis,  $65-85 \times 2.5-3.5 \mu$ ; paraphysibus filiformibus, ramosis, apice vix incrassatis, curvatis vel circinatis.

Hab. ad terram in silvis, autumnno.

Typus in Herb. YASUDA, in Herb. Tokyo Sci. Mus., Japonia.

Loc. typ.: Gongen-mori, prope Sendai, Prov. Rikuzen, Honshû, Japonia.

Area distr.: Japonia.

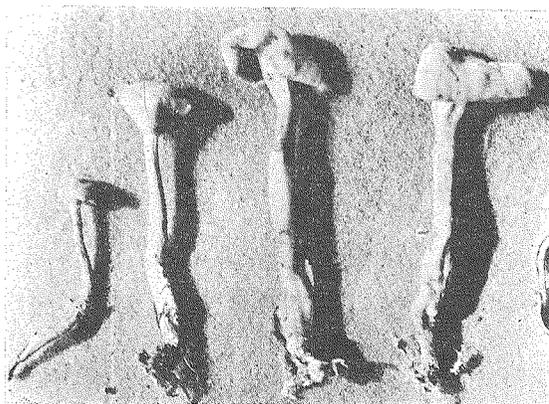


Fig. 5.

*Cudonia japonica* (Specimina in Prov. Rikuzen).

Exempl. invest.:

Honshû—Rikuchû: Takizawa-mura (S. IMAI, Sept. 27, 1937). Rikuzen: Sendai, Gongen-mori (A. YASUDA, Oct. 11, 1914, in Herb. YASUDA; S. IMAI, Oct. 14, 1935; Oct. 14, 1937; Sept. 26, 1938). Shinano: Kiso, Ôdaki (S. IMAI, Sept. 20, 1938). Kai: Masutomi-mura (S. IMAI, Sept. 27, 1940); Oshino-mura (S. IMAI, Oct. 6, 1940). Tamba: Rurikei (S. AKAI, Oct. 22, 1933, in Herb. HEMMI, Univ. Imp. Kyoto); Chii-mura (S. IMAI, Oct. 8, 1941).

The present fungus is well characterized and easily distinguished by the largest spores, measuring  $65-85 \times 2.5-3.5 \mu$ , in this genus.

In his previous paper, the writer mentioned that he could not illustrate the correct characters of *Cudonia orientalis* YASUDA, because LLOYD's diagnosis is too brief and no specimens have been preserved in YASUDA's Herbarium. Fortunately, E. B. MAINS, however, reported some notes on

LLOYD's *Cudonias* from Japan, and states as follows:

"The type of *Cudonia orientalis* (LLOYD Herb. no. 32321) is accompanied by the following data: Sendai, Japan, October 22, 1900, A. YASUDA, 209; fruit-body brown; head 1-2 cm. wide; ascus  $120 \times 10 \mu$ ; ascospore  $80 \times 3 \mu$ . There is a colored drawing (fig. 3) initiated A. Y. showing two ascophores 30 and 42 mm. high with convex hemispherical pilei, 12-16 mm. broad, and stipes 2-4 mm. broad at the bases and tapering somewhat upward. The upper surfaces of the pilei are illustrated as smooth with no indication of folds or ridges. There is a notation 'ascosp. needle-shaped'. The collection (fig. 4) probably contained 7 or 8 ascophores which are now mostly broken. They apparently were 15-18 mm. long and are now brownish black, very hard, the tissues horny. The pilei are somewhat wrinkled and folded, 5-8 mm. wide. The stipes are longitudinally furrowed, 2 mm. below and tapering up to 1 mm. The asci are clavate, much attenuated below,  $100-150 \mu$  long and  $10 \mu$  wide above. No free ascospores were found and those in the asci were not clearly differentiated. LLOYD states that the spores 'appear to be about  $50 \mu$  long'. The paraphyses are hyaline, filiform and somewhat curved at the apices. The size of the spores, an important character, is very doubtful."

Judging from these statements and from the present writer's studies hitherto and observations, *C. orientalis* is clearly the same as *C. japonica* which was subsequently collected in the environs of the same city, Sendai, and published by YASUDA in the preceding year.

As for *C. convoluta*, MAINS has also mentioned that the type of this fungus was apparently separated from YASUDA's collection 209 and the ascophores are pileate, not capitate as LLOYD described them placing considerable emphasis on this character, and that it is doubtful if *C. orientalis* and *C. convoluta* are distinct. Consequently, the latter fungus is more probably the same as *C. japonica*.

Judging from MAINS' statements, LEWIS's collection which was identified as *C. convoluta* by LLOYD is undoubtedly the same as *C. helvelloides* IMAI.

YASUDA's second collection (No. 380) of *C. convoluta* is undoubtedly the same species as *C. constrictospora* which also distributes around Sendai.

### *Cudonia helvelloides* S. ITO et IMAI

*Cudonia convoluta* (non 1916) LLOYD, Myc. Writ. VII, 1230, f. 2568-2569, 1923.

*Cudonia japonica* (non YASUDA) S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148,

1932, pro parte.

*Cudonia helvelloides* S. ITO et IMAI, Trans. Sapporo Nat. Hist. Soc. XIII, 183, t. 7, f. 32-35, 1934.

Nom. jap. *Kura-take*.

Ascomatibus dense caespitosis vel raro gregariis, 2.5-7 cm. altis, pileatis, stipitatis; pileo tenuissimo, primo convexo, deinde helvelloideo, 1-2 cm. lato, hymenio primo pallide flavidulo, deinde pallide isabellino, leviter ruguloso, centro leviter depresso, subtus ruguloso, primo albido breviterque tomentosum, deinde pallide avellaneo minusque tomentosum, margine acuto, libero; stipite tereti vel compresso, basi leviter incrassato, subconcolori, primo albo-flocculoso; ascis clavatis, apice leviter contractis, poro iodo non caerulescentibus, octosporis,  $95-140 \times 7.5-10 \mu$ ; sporis clavato-filiformibus vel acicularibus, hyalinis, levibus, multiseptatis,  $48-60 \times 1.5-2 \mu$ ; paraphysibus, filiformibus, ramosis, apice curvatis vel circinatis, vix vel leviter incrassatis.

Hab. ad terram in silvis, autumno.

Typus in Herb. IMAI, in Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Nopporo, Prov. Ishikari, Hokkaido, Japonia.

Area distr.: Japonia.

Exempl. invest.:

Hokkaido—Ishikari: Nopporo (Y. TOCHINAI & S. IMAI, Sept. 25, 1927; S. IMAI, Oct. 6, 20, 1929; Sept. 18, 1938).

Honshû—Kii: Iwata-mura (S. IMAI, Nov. 16, 1931).

The present fungus is well characterized by the densely caespitose habit and the very thin, delicate pileus as well as by the comparatively large spores.

From the description and figures given by YASUDA, the present writer first considered this fungus to be identical to his *Cudonia japonica* but when the actual type specimen was examined, it became apparent that they are two distinct species differing in respect to the densely caespitose habit and the more thin, delicate and paler colored ascophores, as well as to the more slender and smaller asci and spores.

In 1940, MAINS published a note on LEWIS's collection from Japan which was identified as *C. convoluta* by LLOYD. He says "LEWIS' collection (LLOYD Herb. no. 32323) was identified as *Cudonia convoluta* and illustrated by LLOYD (1923). The collection contained several ascophores. All except one are now broken. They probably measured up to 35 mm.

long. There are 2 or 3 stipes that are pale buff and pilei that are ochraceous. The stipes and the undersides of the pilei are white flocculose. There are a few radial ribs on the undersides of the pilei. The unbroken ascophore is dark brown and horny. The latter has the appearance of having been overheated in drying. The asci are clavate,  $120-150 \times 10 \mu$ , and the ascospores are acicular,  $50-66 \times 2 \mu$ . The paraphyses are filiform, hyaline, and curved or circinate at apices. Curiously enough LLOYD makes no mention of the dark brown specimen which might be interpreted as *C. convoluta*. He states that the collection 'when dry, is pale yellow, not brown, with no red' and 'on its color, could be called a new species.' At the time of LLOYD's statement it was a new species, because it apparently is *Cudonia helvelloides*, as IMAI (1936) has suggested."

### Sect. *Pachycudonia* IMAI

*Cudonia* Sect. *Pachycudonia* IMAI, Bot. Mag. Tokyo, L, 673, 1936.

Pileus convexo-hemiglobosus vel depresso-convexus, crassus et obesus.

Typus: *Cudonia constrictospora* S. ITO et IMAI.

### *Cudonia constrictospora* S. ITO et IMAI

*Cudonia convoluta* [non in Geogloss. (Mai.)] LLOYD, Myc. Writ. V, Letter No. 63, 15, 1916 (Nov.).

*Cudonia constrictospora* S. ITO et IMAI, Trans. Sapporo Nat. Hist. Soc. XIII, 183, t. 7, f. 28-31, 1934.

Nom. jap. *Ô-hoteitake*.

Ascomatibus gregariis vel subcaespitosis, 1.5-5 cm. longis, pileatis, stipitatis, carnis; pileo subgloboso vel hemigloboso, usque ad 1.2 cm. lato, margine acuto, incurvato, undulato vel plano, plerumque ad stipitem adhaerente sed non cohaerente; hymenio convexo, centro leviter depresso, ruguloso, flavidulo, pallide isabellino vel subochraceo; stipite 1.5-4.5 cm. alto, sursum attenuato basi saepe admosum incrassato, apice 1.5-4 mm. crasso, basi ultra 10 mm. crasso, subconcolori; ascis clavatis, basi admosum longe attenuatis, apice contractis, poro iodo non caerulescentibus,  $60-110 \times 5-7.5 \mu$ , octosporis; sporis leviter clavato-filiformibus sed medio constrictis, fasciculatis, hyalinis,  $20-27.5 \times 2 \mu$ ; paraphysibus filiformibus, tenuissimis, hyalinis, ramosis, apice non incrassatis, circinatis.

Hab. ad terram in silvis, autumno.

Typus in Herb. IMAI, in Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Nopporo, Prov. Ishikari, Hokkaido, Japonia.

Area distr.: Japonia.

Exempl. invest.:

Karafuto—Horo (OHTA & IMAI, Sept. 9, 1935).

Hokkaido—Ishikari: Nopporo (S. IMAI, Sept. 24, 1923; Sept. 28, 1930; Oct. 9, 1931; Oct. 17, 1933).

Honshû—Rikuchû: Omyôjin-mura (S. IMAI, Oct. 1, 1935); Monte Takahora (S. IMAI, Sept. 28, 1937). Rikuzen: Sendai (A. YASUDA, Oct. 11, 1914, in Herb. YASUDA, in Herb. Tokyo Sci. Mus.; K. KISHIDA, Oct. 20, 1933). Kai: Masutomi-mura (S. IMAI, Sept. 27, 1940).

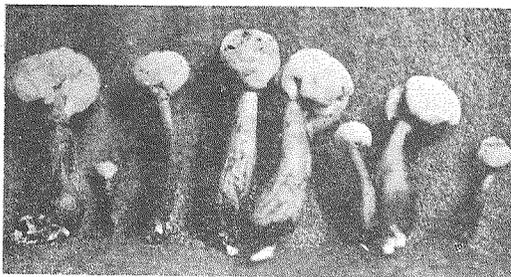


Fig. 6.

*Cudonia constrictospora* (Specimina in Prov. Ishikari).

The present fungus is easily distinguished by the short spores constricted at the middle portion, as well as by the smaller and long tailed asci.

It is very highly probable, after thorough observations macroscopical and microscopical of the authentic specimens, that YASUDA's collection no. 380 which was identified as *C. convoluta* by YASUDA, but considered an obese form of *C. circinans* by LLOYD, is the same as the present species.

#### Subfam. **Hemiglossoidae** S. ITO et IMAI

*Hemiglossoidae* S. ITO et IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 144, 1932, nom. seminud.

Ascoma stipitatum, ramosum vel subsimplex; clavula ramosa vel subsimplex, incisa vel lobata; hymenium laeticoloratum, unilaterali tectum. Asci clavati, inoperculati, octospori; spora ellipsoideae vel fusoideae, hyalinae, continuae; paraphyses praesentes, filiformes.

Typus: *Hemiglossum* PAT.

The present subfamily comprises only one genus, *Hemiglossum* which is well characterized by the incised or branched vertical ascophore having the hymenium developed on one surface only, the other surface remaining sterile.

### *Hemiglossum* PAT.

*Hemiglossum* PAT. Rev. Myc. XII, 135, 1890—SACC. Syll. Fung. X, 2, 1892—MASS. Ann. Bot. XI, 296, 1897.

Ascoma gelatinoso-coriaceum vel coriaceo-carnosum, ramosum vel simplex, linguaeforme vel convolutum, stipitatum; hymenium unilaterale. Asci clavati, inoperculati, octospori; sporae ellipsoideae vel fusoidae, hyalinae, continuae; paraphyses praesentes, filiformes, simplicia, hyalinae.

Typus: *Hemiglossum Yunnanense* PAT.

The type species, *H. Yunnanense* PAT. was collected in Tsang-chau, above Ta-li, Yunnan, China. This is said to be simple or slightly branched and to show reddish color on the fertile face.

### *Hemiglossum Itoanum* IMAI

*Hemiglossum Itoanum* IMAI, Proceed. Jap. Assoc. Adv. Sci. VII, 148, 1932, nom. nud.; Trans. Sapporo Nat. Hist. Soc. XIII, 180, t. 7, f. 9-12, 1934.

Nom. jap. *Fukuro-sango-take*.

Ascomatibus gregariis vel solitariis, ramosis, 1.5-3.5 cm. altis; clavulis ramosis, supra incisus vel lobatis, margine revolutis, 1.5-3 mm. crassis; hymenio glabro, levi, ochraceo vel pallide aurantiaco, unilaterale tecto; facie sterili pallidiori et furfuracei; stipite rigido, 5-15 mm. longo, 2-5 mm. crasso, sordido-brunneo vel castaneo, recto vel flexuoso; ascis clavatis, circa porum iodo caerulescentibus, inoperculatis, octosporis, 30-45 × 3-6 μ; sporis monostichis, longe oblongis vel ellipsoideis, hyalinis, continuis, utrinque leviter obtusis, 5.5-8.5 × 2-2.5 μ; paraphysibus filiformibus, simplicibus, hyalinis.

Hab. ad stirpes emortuos calami parasiticum, autumnum.

Typus in Herb. IMAI, in Univ. Imp. Hokkaido., Sapporo, Japonia.

Loc. typ.: Chitose, Prov. Iburi, Hokkaido, Japonia.

Area distr.: Japonia.

Exempl. invest.:

Hokkaido—Iburi: Chitose (S. IMAI, Sept. 3, 1926; Sept. 7, 1927; Sept. 23, 1929).

The present fungus is of interest, recalling some species of *Clavaria* in macroscopic appearance, and it differs from the Chinese fungus, *H. Yunnanense* PAT., in respect to the beautiful colored and more branched ascophore.

### The Distribution of the Japanese Species.

The Japanese Geoglossaceae reported in this paper comprise thirty seven species with three varieties and thirteen forms, and are systematized into three subfamilies, five tribes and fourteen genera.

The distribution of the Japanese Geoglossaceae in the Empire and other regions in the world is shown in table I.

To conclude with a few statistics of the distribution of the fungi, the endemic species are 9 (24.3%) with 2 varieties and 6 forms. The species distributed in common with North America are 28 (75.6%), among them 9 species (24.3%) are confined to the two regions, amongst which, though, two species extend further to northern South America; while those common with Europe are 19 (51.3%), and among them no species are distributed in Europe and Japan only, except *Geoglossum glabrum* PERS. ex FR. which has a doubtful distribution for North America at the present.

Among the species distributed in common with North America, the fungi common with eastern States are 28 (75.6%), while those common with western States are 11 (29.7%).

Table I. Showing the distribution of the Japanese Geoglossaceae in the Empire and other regions of the world.

Species	Regions													
	Japan						Tropical Asia	Europe		Africa*		North America		South America
	Karafuto	Hokkaido	N. P. Honshu	S. W. Honshu	Shikoku	Kyushu		China	North	South	North	West	East	North
<i>Ascocorynium irregulare</i>	+	+											+	+
<i>Ascocorynium vitellinum</i>				+		+							+	
<i>Mitrella paludosa</i>	+		+	+						+	+		+	
<i>Gymnomitrella abietis</i>		+								+	+		+	+
<i>Gymnomitrella gracilis</i>			+							+			+	+
<i>Scleromitrella Shiraiana</i>			+	+										
<i>Microglossum viride</i>		+	+			+				+	+		+	
<i>Microglossum olivaceum</i>		+								+	+		+	+
<i>Microglossum rufum</i>		+	+	+			+						+	+
<i>Microglossum fumosum</i>		+	+										+	
<i>Microglossum longisporum</i>		+		+									+	
<i>Microglossum atropurpureum</i>		+	+							+	+		+	
<i>Microglossum robustum</i>		+								+			+	
<i>Microglossum arenarium</i>		+								+			+	
<i>Spathularia flavida</i>	+	+	+				+			+	+		+	+
<i>Spathularia velutipes</i>			+	+	+								+	
<i>Geoglossum glabrum</i>		+	+					(+)	(+)	+	+		(+)	(+)
<i>Geoglossum simile</i>			+										(+)	(+)
<i>Geoglossum japonicum</i>		+	+										+	+

\*) The distributions of the species in Africa and southern South America are not known to the writer at the present time.

\*\*), The indications with parentheses indicate doubtful determination or distribution.



Table I (Continued)

Species	Regions											
	Japan											
	Karaluo	Hokkaido	N. Honshu	S. W. Honshu	Shikoku	Kyushu	China	Siberia	Tropical Asia	Australia	Europe	North America
												North America
												West
												North
												South
												South America
<i>L. l. f. minima</i>	+	+										
<i>L. l. f. farviaurantipes</i>			+									
<i>L. l. f. atrovirens</i>				+							+	(+)
<i>Leotia rutilans</i>				+								
<i>Sarcoleotia nigra</i>		+										
<i>Cudonia circinans</i>	+	+	+								+	+
<i>Cudonia japonica</i>			+	+								
<i>Cudonia helvellaoides</i>		+		+		+						
<i>Cudonia constrictospora</i>	+	+	+									
<i>Hemiglossum Itoanum</i>	+											
	4	29 (2, 5)*	24 (1, 8)	15 (1, 8)	1	4 (2, 1)	2	1	3	5	18 (1, 4)	19 (1, 4) 51.3%
											15 (0, 2)	28 (1, 4) 75.6%
												11 (0, 2) 29.7%
												6 (0, 2)
												6 (0, 2) 16.2%

\*). The numbers in parentheses are of variety and form.

## CONTENTS

Introductory note ... ..	155
Geoglossaceae SCHROET. . . . .	158
Clavis Subfamiliae Geoglossacearum Japoniae . . . . .	160
Geoglossoideae S. ITO et IMAI ... ..	160
Clavis triborum generiumque Geoglossoidearum ... ..	161
Mitruleae (KARST, p. p.) IMAI ... ..	162
<i>Ascocorynium</i> S. ITO et IMAI ... ..	162
Clavis specierum ... ..	163
<i>Ascocorynium irregulare</i> (PK.) S. ITO et IMAI... ..	163
<i>Ascocorynium vitelinum</i> (BRES.) S. ITO et IMAI. ... ..	166
<i>Mitruia</i> FR. emend. IMAI... ..	167
<i>Mitruia fauudosa</i> FR. ... ..	169
<i>Gymnomitruia</i> IMAI ... ..	172
Clavis specierum ... ..	172
<i>Gymnomitruia abietis</i> (FR.) IMAI... ..	173
<i>Gymnomitruia gracilis</i> (KARST.) IMAI... ..	175
<i>Scleromitruia</i> IMAI ... ..	176
<i>Scleromitruia Shiraiana</i> (P. HENN.) IMAI ... ..	177
<i>Microglossum</i> GILL. ... ..	178
Clavis sectionum et specierum ... ..	181
Sect. Eumicroglossum (SCHROET.) UNDERW. emend. IMAI... ..	181
<i>Microglossum viride</i> ([SCHRAD.] PERS. ex FR.) GILL. ... ..	181
<i>Microglossum oivaceum</i> (PERS. ex FR.) GILL. ... ..	184
Sect. Ochroglossum IMAI ... ..	186
<i>Microglossum rufum</i> (SCHW.) UNDERW. ... ..	186
<i>Microglossum fumosum</i> (PK.) DURAND . . . . .	190
<i>Microglossum longisporum</i> DURAND ... ..	191
Sect. Melanoglossum IMAI... ..	192
<i>Microglossum atropurpureum</i> (PERS. ex FR.) KARST. ... ..	192
<i>Microglossum robustum</i> (DUR.) A. L. SM. et RAMSB. ... ..	196
<i>Microglossum arenarium</i> ROSTR. ... ..	197
Spathularieae IMAI... ..	198
<i>Spathularia</i> PERS. ex FR. ... ..	198
Clavis specierum ... ..	199
<i>Spathularia flavida</i> PERS. ex FR. . . . .	199
<i>Spathularia velutipes</i> CKE. et FARLOW. ... ..	202
Geoglosseae IMAI ... ..	205

<i>Geoglossum</i> PERS. ex FR. emend. DURAND ... .. .	205
Clavis specierum ... .. .	206
<i>Geoglossum glabrum</i> PERS. ex FR. ... .. .	207
<i>Geoglossum simile</i> PK. ... .. .	209
<i>Geoglossum japonicum</i> IMAI ... .. .	210
<i>Geoglossum nigratum</i> (FR.) CKE. ... .. .	211
<i>Geoglossum fallax</i> DURAND ... .. .	213
<i>Geoglossum fallax</i> DUR. var. <i>proximum</i> (IMAI et MINAK.) IMAI ... .. .	214
<i>Geoglossum fallax</i> DUR. var. <i>subpunitum</i> (IMAI) IMAI ... .. .	215
<i>Geoglossum alveolatum</i> (REHM) DURAND ... .. .	216
<i>Geoglossum punitum</i> WINT. ... .. .	217
<i>Trichoglossum</i> BOUD. ... .. .	218
Clavis specierum ... .. .	218
<i>Trichoglossum hirsutum</i> (PERS. ex FR.) BOUD. ... .. .	219
<i>Trichoglossum hirsutum</i> (PERS. ex FR.) BOUD. f. <i>cajutum</i> (PERS.) IMAI ... .. .	221
<i>Trichoglossum hirsutum</i> (PERS. ex FR.) BOUD. f. <i>depauperatum</i> (LLOYD) S. ITO et IMAI ... .. .	222
<i>Trichoglossum hirsutum</i> (PERS. ex FR.) BOUD. var. <i>variabile</i> (DUR.) IMAI ... .. .	222
<i>Trichoglossum Farlowi</i> (CKE.) DURAND ... .. .	223
<i>Trichoglossum Walteri</i> (BERK.) DURAND ... .. .	224
<i>Gloeoglossum</i> DURAND . ... .. .	226
Clavis specierum ... .. .	227
<i>Gloeoglossum glutinosum</i> (PERS. ex FR.) DURAND ... .. .	227
<i>Gloeoglossum difforme</i> (FR.) DURAND ... .. .	229
Cudonioidae S. ITO et IMAI . ... .. .	231
Clavis triborum et generum ... .. .	232
Leotieae REHM, emend. IMAI. ... .. .	233
<i>Neocudoniella</i> IMAI ... .. .	233
<i>Neocudoniella jezoensis</i> (IMAI) IMAI ... .. .	234
<i>Leotia</i> PERS. ex FR. ... .. .	234
Clavis specierum ... .. .	237
<i>Leotia lubrica</i> [SCOP.] PERS. ex FR. ... .. .	237
<i>Leotia lubrica</i> [SCOP.] PERS. ex FR. f. <i>gigantea</i> IMAI ... .. .	239
<i>Leotia lubrica</i> [SCOP.] PERS. ex FR. f. <i>ochracea</i> IMAI ... .. .	239
<i>Leotia lubrica</i> [SCOP.] PERS. ex FR. f. <i>anthocephala</i> IMAI et MINAK. ... .. .	240
<i>Leotia lubrica</i> [SCOP.] PERS. ex FR. f. <i>Towadensis</i> IMAI ... .. .	240
<i>Leotia lubrica</i> [SCOP.] PERS. ex FR. f. <i>viscosa</i> IMAI ... .. .	240
<i>Leotia lubrica</i> [SCOP.] PERS. ex FR. f. <i>Kawanurae</i> IMAI ... .. .	241
<i>Leotia lubrica</i> [SCOP.] PERS. ex FR. f. <i>chlorocephala</i> MASS. ... .. .	242
<i>Leotia lubrica</i> [SCOP.] PERS. ex FR. f. <i>fortentosa</i> IMAI et MINAK. ... .. .	243

<i>Leotia lubrica</i> [SCOP.] PERS. ex FR. f. <i>minima</i> IMAI . . . . .	243
<i>Leotia lubrica</i> [SCOP.] PERS. ex FR. f. <i>parviaurantipes</i> IMAI . . . . .	244
<i>Leotia lubrica</i> [SCOP.] PERS. ex FR. f. <i>atrovirens</i> (PERS. ex FR.) IMAI . . . . .	244
<i>Leotia rutilans</i> (IMAI et MINAK.) IMAI . . . . .	246
<i>Sarcoleotia</i> S. ITO et IMAI . . . . .	246
<i>Sarcoleotia nigra</i> S. ITO et IMAI... . . . .	247
Cudonieae (KARST. p. p.) IMAI . . . . .	247
<i>Cudonia</i> FR. . . . .	248
Clavis sectionum et specierum . . . . .	248
Sect. Eucudonia IMAI... . . . .	249
<i>Cudonia circinans</i> (PERS. ex FR.) FR. . . . .	249
<i>Cudonia japonica</i> YASUDA . . . . .	251
<i>Cudonia hevelloides</i> S. ITO et IMAI . . . . .	253
Sect. Pachycudonia IMAI . . . . .	255
<i>Cudonia constrictospora</i> S. ITO et IMAI . . . . .	255
Hemiglossoidae S. ITO et IMAI... . . . .	256
<i>Hemiglossum</i> PAT.. . . . .	257
<i>Hemiglossum Itoanum</i> IMAI . . . . .	257
The Distribution of the Japanese Species... . . . .	258
Contents . . . . .	262
Explanations of Plates.	

PLATE VI

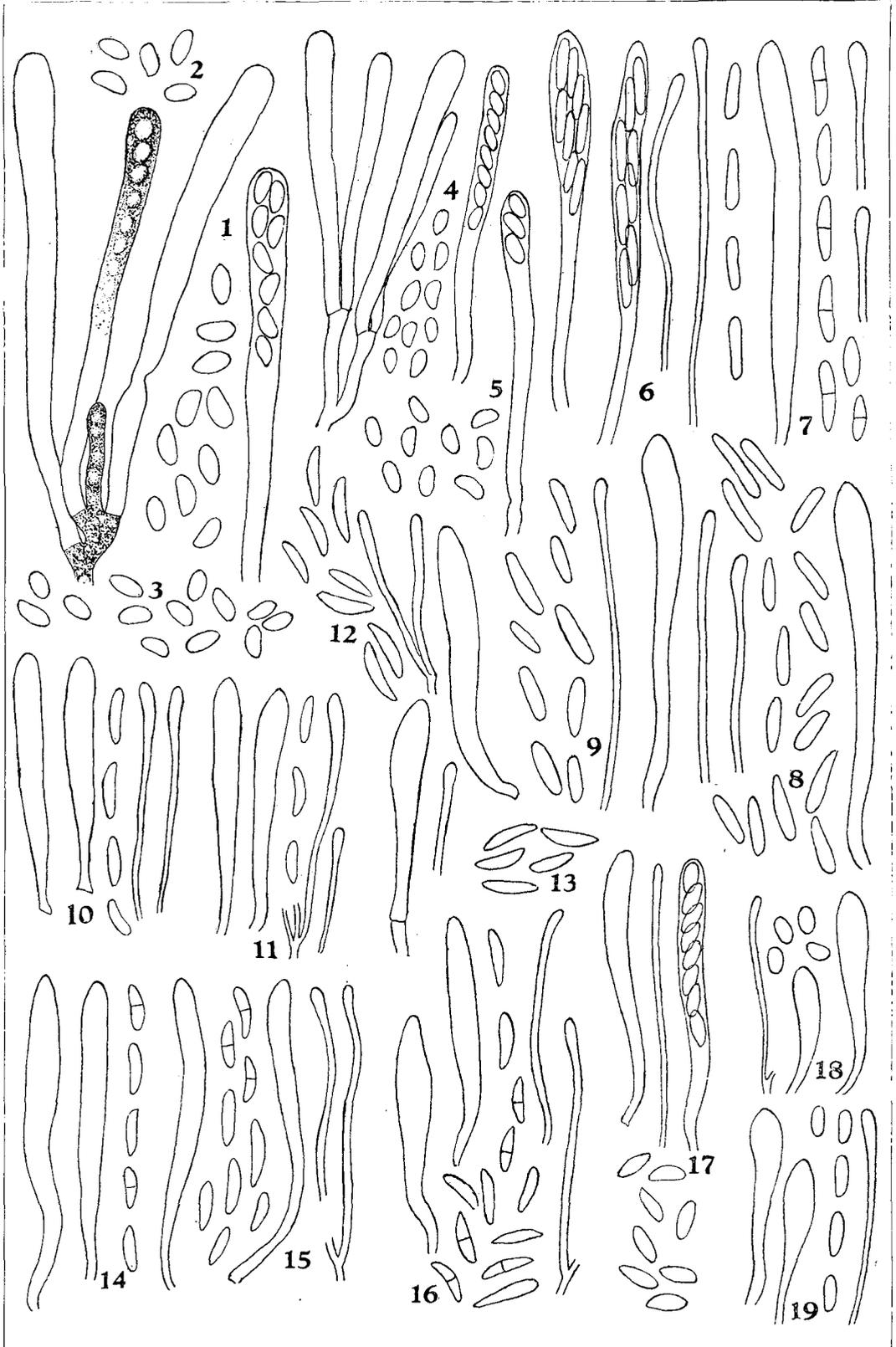
Faint, illegible text, likely bleed-through from the reverse side of the page.

Plate VI

Faint, illegible text, likely bleed-through from the reverse side of the page.

## Explanation of Plate VI

- Fig. 1. *Ascocorynium irregulare*: Japanese specimen (Tokachi, Mt. Nupkaushinupri, S. IMAI, Sept. 29, 1929). 4 asci  $\times$  ca. 650, 10 free spores  $\times$  ca. 650.
- Fig. 2. Ditto: North American specimen (Maine, Mt. Desert Island, E. E. MORSE, Nov. 1935). 5 spores  $\times$  ca. 650.
- Fig. 3. Ditto: North American specimen (Colorado, Vicinity of Tolland, F. J. SEAVER & E. BETHEL, Aug. 24-26, 1910). 13 spores  $\times$  ca. 650.
- Fig. 4. *Ascocorynium vitellinum*: Japanese specimen (Hizen, Mt. Unzen, S. IMAI, Oct. 22, 1939). 5 asci  $\times$  ca. 650, 10 free spores  $\times$  ca. 650.
- Fig. 5. Ditto: North American specimen (Virginia, Falls Church, C. L. SHEAR, Nov. 5, 1931). 1 ascus  $\times$  ca. 650, 9 free spores  $\times$  ca. 650.
- Fig. 6. *Mitrula paludosa*: Japanese specimen (Rikuchū, Morioka, G. YAMADA, May 27, 1917). 2 asci  $\times$  ca. 650, 4 free spores  $\times$  ca. 650, 2 paraphyses  $\times$  ca. 650.
- Fig. 7. Ditto: European specimen (Norway, Møre & Romsdal, Sunnlyven—Fibelstadhaugen, A. BLYTT, Aug. 8, 1881, type material of *Mitrula norvegica*). 1 ascus  $\times$  ca. 650, 7 free spores  $\times$  ca. 650, 2 paraphyses  $\times$  ca. 650.
- Fig. 8. Ditto: North American specimen (Canada, Ontario, H. S. JACKSON & al., June 23, 1932). 1 ascus  $\times$  ca. 650, 16 free spores  $\times$  ca. 650, 2 paraphyses  $\times$  ca. 650.
- Fig. 9. Ditto: North American specimen (Massachusetts, Belmont, CHAS. BULLARD, June, 1900). 1 ascus  $\times$  ca. 650, 9 free spores  $\times$  ca. 650, 1 paraphysis  $\times$  ca. 650.
- Fig. 10. *Gymnomitrula abietis*: Japanese specimen (Ishikari, Mt. Soranuma, S. IMAI, Sept. 19, 1939). 2 asci  $\times$  ca. 650, 4 free spores  $\times$  ca. 650, 2 paraphyses  $\times$  ca. 650.
- Fig. 11. Ditto: European specimen (Norway, Oslo, Oslo-Tøyen, N. MOE, Sept. 1840). 2 asci  $\times$  ca. 650, 3 free spores  $\times$  ca. 650, 2 paraphyses  $\times$  ca. 650.
- Fig. 12. Ditto: North American specimen (Maine, Kittery Point, R. THAXTER, Sept. 20, 1896). 2 asci  $\times$  ca. 650, 8 free spores  $\times$  ca. 650, 3 paraphyses  $\times$  ca. 650.
- Fig. 13. Ditto: European specimen (Germany, Königstein a/Elbe, KRIEGER, Oct. 1893, REHM's Ascomyceten No. 1116). 5 spores  $\times$  ca. 650.
- Fig. 14. *Gymnomitrula gracilis*: Japanese specimen (Mutsu, Mt. Hakkōda, S. IMAI, Sept. 19, 1937). 2 asci  $\times$  ca. 650, 5 free spores  $\times$  ca. 650.
- Fig. 15. Ditto: European specimen (Norway, Hedmark, Østerdalen, M. N. BLYTT). 2 asci  $\times$  ca. 650, 9 free spores  $\times$  ca. 650, 2 paraphyses  $\times$  ca. 650.
- Fig. 16. Ditto: North American specimen (Colorado, Geneva Creek Canyon, F. J. SEAVER & E. BETHEL, Sept. 3-12, 1910). 2 asci  $\times$  ca. 650, 12 free spores  $\times$  ca. 650, 2 paraphyses  $\times$  ca. 650.
- Fig. 17. *Scleronitrula Shiraiana*: Japanese specimen (Musashi, Tokyo, Komaba, S. KUSANO, May 3, 1925). 2 asci  $\times$  ca. 650, 8 free spores  $\times$  ca. 650, 1 paraphysis  $\times$  ca. 650.
- Fig. 18. *Neocudoniella jezoensis*: Japanese specimen (Ishikari, Sapporo, Mt. Moiwa, K. SASAKI, Oct. 20, 1929). 2 asci  $\times$  ca. 650, 4 free spores  $\times$  ca. 650, 1 paraphysis  $\times$  ca. 650.
- Fig. 19. *Hemiglossum Itoanum*: Japanese specimen (Iburi, Chitose, S. IMAI, Sept. 3, 1926). 2 asci  $\times$  ca. 650, 5 free spores  $\times$  ca. 650, 1 paraphysis  $\times$  ca. 650.

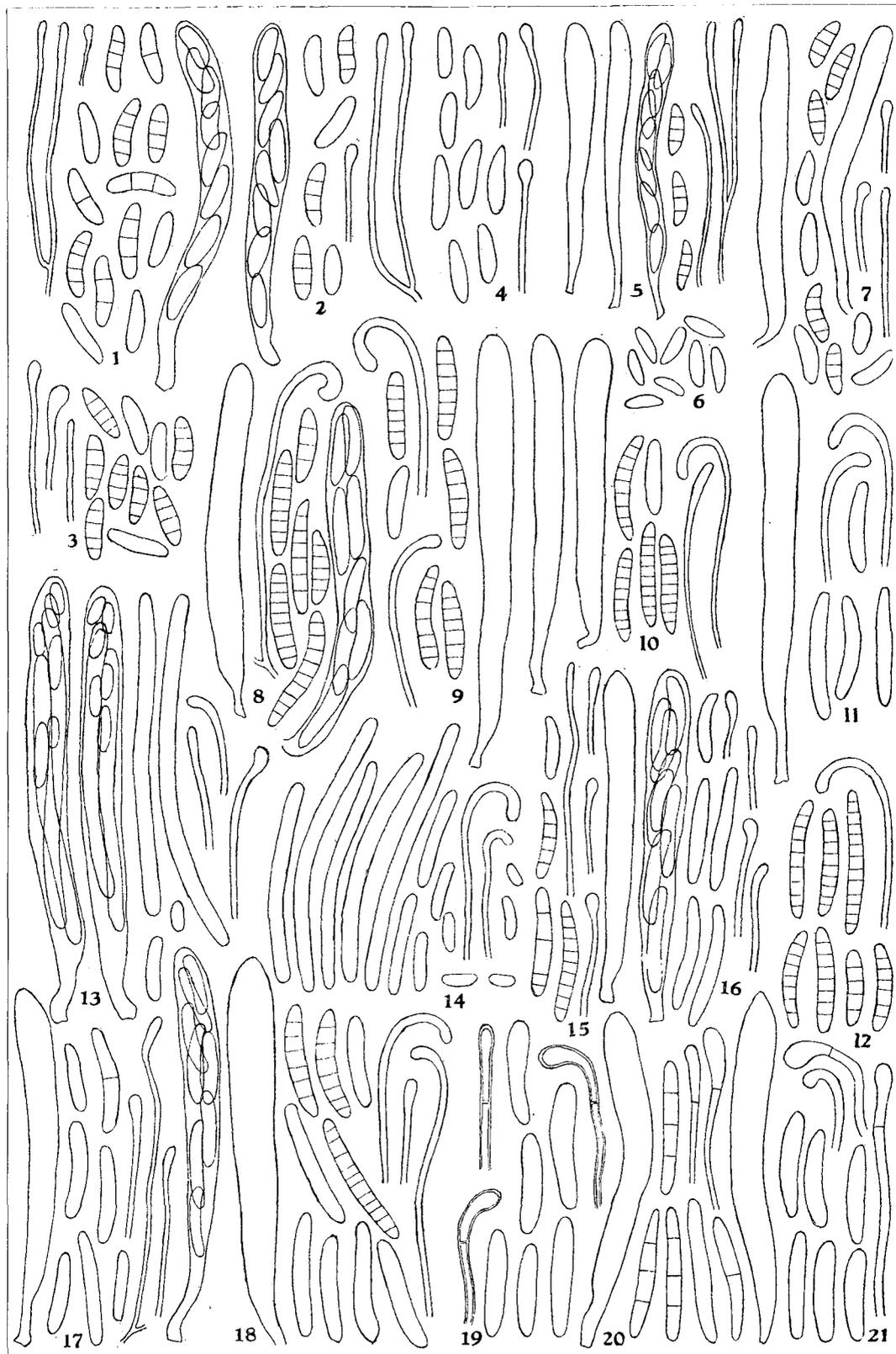


Faint, illegible text, possibly bleed-through from the reverse side of the page.

## Plate VII

## Explanation of Plate VII

- Fig. 1. *Microglossum viride*: Japanese specimen (Kushiro, Akan, S. IMAI, Sept. 16, 1933). 1 ascus  $\times$  ca. 500, 13 free spores  $\times$  ca. 500, 3 paraphyses  $\times$  ca. 500.
- Fig. 2. Ditto: North American specimen (Massachusetts, Canton, D. H. LINDER, Aug. 2, 1936).  
• 1 ascus  $\times$  ca. 500, 6 free spores  $\times$  ca. 500, 3 paraphyses  $\times$  ca. 500.
- Fig. 3. Ditto: North American specimen (Alabama, L. M. UNDERWOOD, 1896, UNDERWOOD'S type of *Leptoglossum alabamense*). 10 spores  $\times$  ca. 500, 3 paraphyses  $\times$  ca. 500.
- Fig. 4. Ditto: European specimen (Germany, Grosshesseloh, KUMMER, Sept. 3, 1854). 8 spores  $\times$  ca. 500, 3 paraphyses  $\times$  ca. 500.
- Fig. 5. *Microglossum olivaceum*: Japanese specimen (Ishikari, Nopporo, S. IMAI, Oct. 15, 1933).  
• 3 asci  $\times$  ca. 500, 3 free spores  $\times$  ca. 500, 3 paraphyses  $\times$  ca. 500.
- Fig. 6. Ditto: European specimen (Germany, Havel, Rathenow, T. PLÖTTNER, Oct. 17, 1900).  
• 8 free spores  $\times$  ca. 500.
- Fig. 7. Ditto: North American specimen (New York, Ithaca, Fall Creek, W. W. RAY, July 20, 1935). 2 asci  $\times$  ca. 500, 10 spores  $\times$  ca. 500, 3 paraphyses  $\times$  ca. 500.
- Fig. 8. *Microglossum rufum*: Japanese specimen (Ishikari, Mt. Soranuma, S. IMAI, Sept. 19, 1930).  
• 2 asci  $\times$  ca. 500, 6 free spores  $\times$  ca. 500, 1 paraphysis  $\times$  ca. 500.
- Fig. 9. Ditto: North American specimen (North Carolina, Transylvania, W. A. MURRILL & H. D. HOUSE, July 13-24, 1908). 1 ascus  $\times$  ca. 500, 6 spores  $\times$  ca. 500, 2 paraphyses  $\times$  ca. 500.
- Fig. 10. *Microglossum fumosum*: Japanese specimen (Ishikari, Mt. Soranuma, Y. TOCHINAI & S. IMAI, Sept. 19, 1930). 2 asci  $\times$  ca. 500, 5 spores  $\times$  ca. 500, 2 paraphyses  $\times$  ca. 500.
- Fig. 11. Ditto: North American specimen (New York, Woods North of Verma, REDDICK, July 19, 1906). 1 ascus  $\times$  ca. 500, 4 spores  $\times$  ca. 500, 2 paraphyses  $\times$  ca. 500.
- Fig. 12. Ditto: (New York, Ithaca, Ring wood, W. W. RAY, July 29, 1935). 7 spores  $\times$  ca. 500, 1 paraphysis  $\times$  ca. 500.
- Fig. 13. *Microglossum longisporum*: Japanese specimen (Kii, Shimo-maro, prope Tanabe, K. MINAKATA, Oct. 2, 1917). 2 asci  $\times$  ca. 500, 4 free spores  $\times$  ca. 500, 3 paraphyses  $\times$  ca. 500.
- Fig. 14. Ditto: North American specimen (New York, Ithaca, Six mile Creek, E. J. DURAND, Aug. 12, 1902). 14 spores  $\times$  ca. 500, 2 paraphyses  $\times$  ca. 500.
- Fig. 15. *Microglossum atropurpureum*: Japanese specimen (Ishikari, Mt. Teine, Y. TOKUNAGA, Sept. 23, 1929). 1 ascus  $\times$  ca. 500, 4 spores  $\times$  ca. 500, 4 paraphyses  $\times$  ca. 500.
- Fig. 16. Ditto: European specimen (Norway, Hordaland, Kvinnherad-Tufta in Ølve, T. LILLEFOSSE, Sept. 12, 1930). 1 ascus  $\times$  ca. 500, 5 free spores  $\times$  ca. 500, 4 paraphyses  $\times$  ca. 500.
- Fig. 17. *Microglossum robustum*: Japanese specimen (Ishikari, Nopporo, S. IMAI, Oct. 2, 1932).  
• 2 asci  $\times$  ca. 500, 7 free spores  $\times$  ca. 500, 3 paraphyses  $\times$  ca. 500.
- Fig. 18. Ditto: North American specimen (North Carolina, Blowing Rock, E. J. DURAND, July 20-Sept. 14, 1901, DURAND'S Herb. No. 1299 in Cornell Univ.). 1 ascus  $\times$  ca. 500, 9 spores  $\times$  ca. 500, 3 paraphyses  $\times$  ca. 500.
- Fig. 19. *Microglossum arenarium*: North American specimen (Labrador, L'Anse au Mort, The Straits, A. C. WAGHORNE, Sept. 28, 1894, PECK'S type of *Leptoglossum latum*). 6 spores  $\times$  ca. 500, 3 paraphyses  $\times$  ca. 500.
- Fig. 20. Ditto: Japanese specimen (Iburi, Shikotsu, S. IMAI, Sept. 19, 1931). 1 ascus  $\times$  ca. 500, 5 spores  $\times$  ca. 500, 2 paraphyses  $\times$  ca. 500.
- Fig. 21. Ditto: European specimen (Norway, Vest-Agder, Halse & Harkmark—Risøbank, R. FRITZ, Aug. 1881). 1 ascus  $\times$  ca. 500, 6 spores  $\times$  ca. 500, 3 paraphyses  $\times$  ca. 500.



## **Plate VIII**

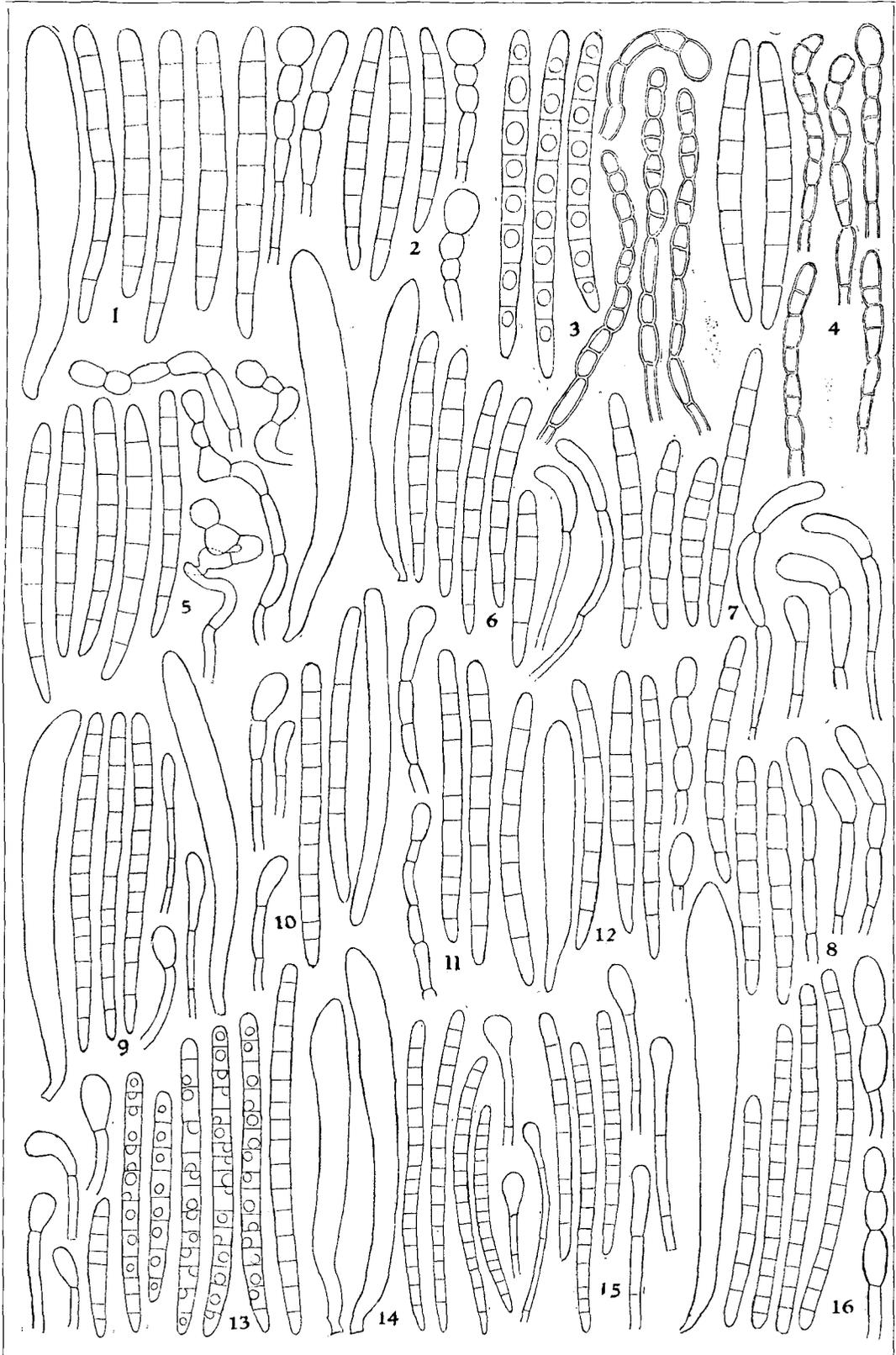
## Explanation of Plate VIII

- Fig. 1. *Geoglossum glabrum*: Japanese specimen (Kushiro, Akan, K. MIYABE, Aug. 1920). 1 ascus  $\times$  ca. 300, 5 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 600.
- Fig. 2. Ditto: European specimen (Germany, Bavaria, Oberpfalz, Sept. 1927, ex Herb. KILLERMANN). 3 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 600.
- Fig. 3. *Geoglossum simile*: Japanese specimen (Shimotsuke, Oku-nikkō, S. IMAI, Oct. 7, 1937). 3 spores  $\times$  ca. 600, 4 paraphyses  $\times$  ca. 600.
- Fig. 4. Ditto: North American specimen (New York, Lower Enfield Glen, J. A. STEVENSON, Aug. 20, 1935). 2 spores  $\times$  ca. 600, 5 paraphyses  $\times$  ca. 600.
- Fig. 5. *Geoglossum japonicum*: Japanese specimen (Iburi, Nakanoshima in Tōya lake, G. HAYASHI, Sept. 27, 1932). 1 ascus  $\times$  ca. 300, 5 spores  $\times$  ca. 600, 4 paraphyses  $\times$  ca. 600.
- Fig. 6. *Geoglossum nigritum*: Japanese specimen (Ishikari, Mt. Soranuma, S. IMAI, Sept. 19, 1930). 1 ascus  $\times$  ca. 300, 5 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 600.
- Fig. 7. Ditto: European specimen (Norway, Akershus, Baerum, A. BLYTT, Sept. 1882). 4 spores  $\times$  ca. 600, 4 paraphyses  $\times$  ca. 600.
- Fig. 8. Ditto: North American specimen (Massachusetts, How, G. E. MORRIS, Aug. 10, 1909). 3 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.
- Fig. 9. *Geoglossum fallax*: Japanese specimen (Ishikari, Nopporo, S. IMAI, Oct. 2, 1932). 2 asci  $\times$  ca. 300, 3 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.
- Fig. 10. Ditto: North American specimen (New York, Ithaca, Coy Glen, J. D. REDDICK, July 5, 1905, DURAND's type). 3 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.
- Fig. 11. Ditto: European specimen (Sweden, Uppland, Arentuna parish, Störvreta, S. LUNDELL, Sept. 18, 1920). 3 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 600.
- Fig. 12. *Geoglossum fallax* var. *proximum*: Japanese specimen (Kii, Wakayama, K. MINAKATA, April 3, 1902). 1 ascus  $\times$  ca. 300, 3 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 600.
- Fig. 13. *Geoglossum fallax* var. *subpumilum*: Japanese specimen (Ishikari, Nopporo, S. IMAI, Nov. 9, 1930). 7 spores  $\times$  ca. 600, 4 paraphyses  $\times$  ca. 600.
- Fig. 14. *Geoglossum alveolatum*: Japanese specimen (Ishikari, Nopporo, S. IMAI, Oct. 2, 1932). 2 asci  $\times$  ca. 300, 4 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.
- Fig. 15. Ditto: North American specimen (New York, Canandaigua, Tichenor's Glen, E. J. DURAND, Aug. 27, 1902, DURAND's type). 3 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.
- Fig. 16. *Geoglossum pumilum*: Japanese specimen (Ishikari, Nopporo, S. IMAI, Oct. 2, 1932). 1 ascus  $\times$  ca. 300, 4 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 600.

## Plate VIII

## Explanation of Plate VIII

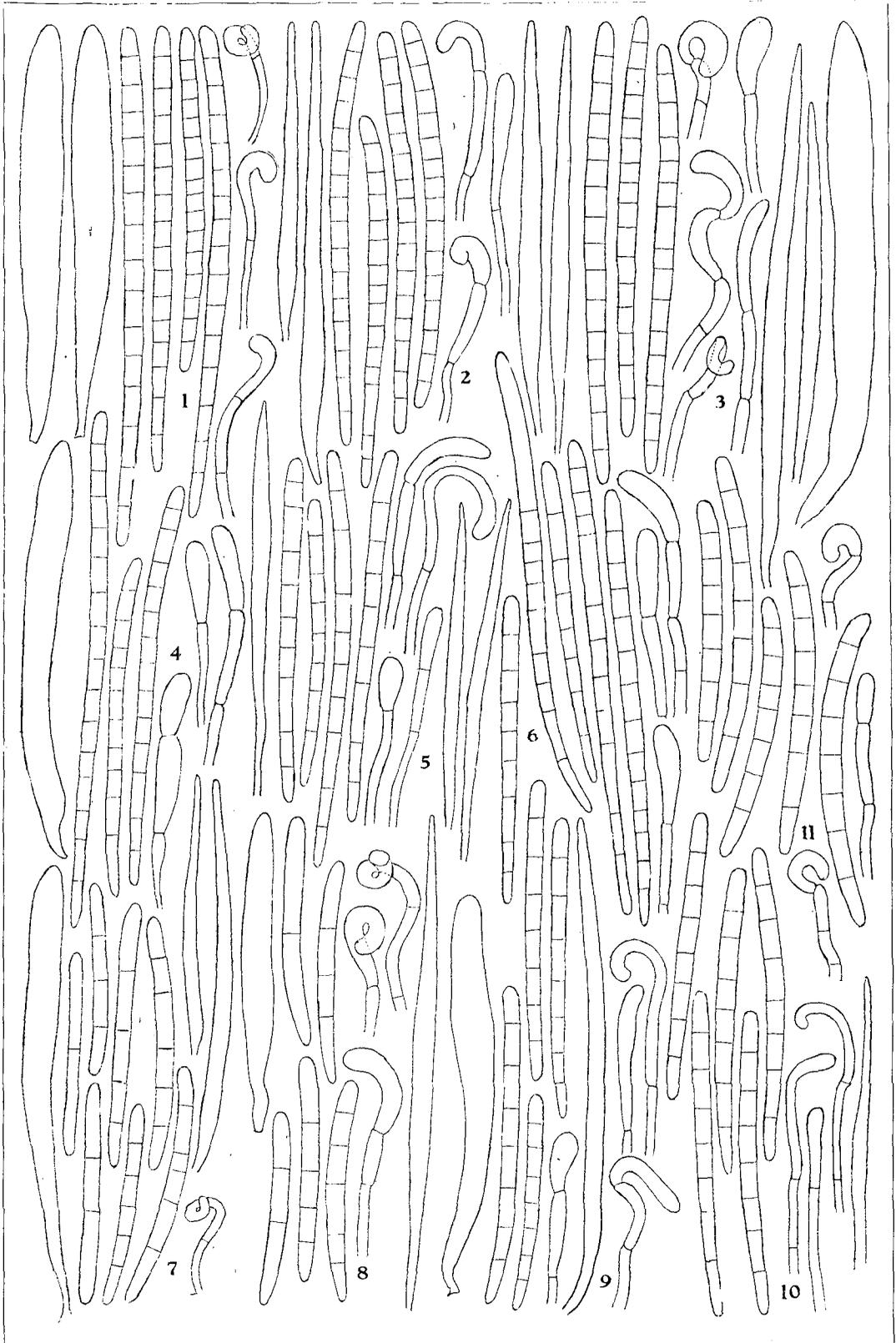
- Fig. 1. *Geoglossum glabrum*: Japanese specimen (Kushiro, Akan, K. MIYABE, Aug. 1920). 1 ascus  $\times$  ca. 300, 5 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 600.
- Fig. 2. Ditto: European specimen (Germany, Bavaria, Oberpfalz, Sept. 1927, ex Herb. KILLERMANN). 3 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 600.
- Fig. 3. *Geoglossum simile*: Japanese specimen (Shimotsuke, Oku-nikkô, S. IMAI, Oct. 7, 1937). 3 spores  $\times$  ca. 600, 4 paraphyses  $\times$  ca. 600.
- Fig. 4. Ditto: North American specimen (New York, Lower Enfield Glen, J. A. STEVENSON, Aug. 20, 1935). 2 spores  $\times$  ca. 600, 5 paraphyses  $\times$  ca. 600.
- Fig. 5. *Geoglossum japonicum*: Japanese specimen (Iburi, Nakanoshima in Tôya lake, G. HAYASHI, Sept. 27, 1932). 1 ascus  $\times$  ca. 300, 5 spores  $\times$  ca. 600, 4 paraphyses  $\times$  ca. 600.
- Fig. 6. *Geoglossum nigratum*: Japanese specimen (Ishikari, Mt. Soranuma, S. IMAI, Sept. 19, 1930). 1 ascus  $\times$  ca. 300, 5 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 600.
- Fig. 7. Ditto: European specimen (Norway, Akershus, Baerum, A. BLYTT, Sept. 1882). 4 spores  $\times$  ca. 600, 4 paraphyses  $\times$  ca. 600.
- Fig. 8. Ditto: North American specimen (Massachusetts, How, G. E. MORRIS, Aug. 10, 1909). 3 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.
- Fig. 9. *Geoglossum fallax*: Japanese specimen (Ishikari, Nopporo, S. IMAI, Oct. 2, 1932). 2 asci  $\times$  ca. 300, 3 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.
- Fig. 10. Ditto: North American specimen (New York, Ithaca, Coy Glen, J. D. REDDICK, July 5, 1905, DURAND's type). 3 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.
- Fig. 11. Ditto: European specimen (Sweden, Uppland, Arentuna parish, Storrreta, S. LUNDELL, Sept. 18, 1920). 3 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 600.
- Fig. 12. *Geoglossum fallax* var. *proximum*: Japanese specimen (Kii, Wakayama, K. MINAKATA, April 3, 1902). 1 ascus  $\times$  ca. 300, 3 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 600.
- Fig. 13. *Geoglossum fallax* var. *subpumilum*: Japanese specimen (Ishikari, Nopporo, S. IMAI, Nov. 9, 1930). 7 spores  $\times$  ca. 600, 4 paraphyses  $\times$  ca. 600.
- Fig. 14. *Geoglossum alveolatum*: Japanese specimen (Ishikari, Nopporo, S. IMAI, Oct. 2, 1932). 2 asci  $\times$  ca. 300, 4 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.
- Fig. 15. Ditto: North American specimen (New York, Canandaigua, Tichenor's Glen, E. J. DURAND, Aug. 27, 1902, DURAND's type). 3 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.
- Fig. 16. *Geoglossum pumilum*: Japanese specimen (Ishikari, Nopporo, S. IMAI, Oct. 2, 1932). 1 ascus  $\times$  ca. 300, 4 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 600.



**Plate IX**

## Explanation of Plate IX

- Fig. 1. *Trichoglossum hirsutum*: Japanese specimen (Ishikari, Nopporo, S. IMAI, Sept. 4, 1927). 2 asci  $\times$  ca. 300, 4 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600, 2 cystidia  $\times$  ca. 300.
- Fig. 2. Ditto: European specimen (Norway, Oslo, Ekeberg, F. C. SCHÜBELER, Sept. 1838). 4 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600, 2 cystidia  $\times$  ca. 300.
- Fig. 3. Ditto: North American specimen (Maryland, Beltsville, W. H. MCATEE, Sept. 19, 1926). 1 ascus  $\times$  ca. 300, 3 spores  $\times$  ca. 600, 5 paraphyses  $\times$  ca. 600, 2 cystidia  $\times$  ca. 300.
- Fig. 4. *Trichoglossum hirsutum* var. *variabile*: Japanese specimen (Iburi, Chitose, S. IMAI, Sept. 7, 1927). 1 ascus  $\times$  ca. 300, 3 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600, 1 cystidium  $\times$  ca. 300.
- Fig. 5. Ditto: European specimen (Sweden, Uppland, Vänge parish, "Fiby urshog", J. A. NANN-FELDT, Oct. 8, 1930). 4 spores  $\times$  ca. 600, 4 paraphyses  $\times$  ca. 600, 2 cystidia  $\times$  ca. 300.
- Fig. 6. Ditto: North American specimen (New York, Oneida County, Knoxboro, H. S. JACKSON, Aug. 20, 1904). 5 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.
- Fig. 7. *Trichoglossum Farlowi*: Japanese specimen (Kii, Seto, K. MINAKATA, July 13, 1902). 1 ascus  $\times$  ca. 300, 7 spores  $\times$  ca. 600, 1 paraphysis  $\times$  ca. 600, 2 cystidia  $\times$  ca. 300.
- Fig. 8. Ditto: North American specimen (Massachusetts, Canton, D. H. LINDER, Sept. 30, 1933). 1 ascus  $\times$  ca. 300, 5 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600, 1 cystidium  $\times$  ca. 300.
- Fig. 9. *Trichoglossum Walleri*: Japanese specimen (Ishikari, Nopporo, S. IMAI, Sept. 4, 1927). 1 ascus  $\times$  ca. 300, 4 spores  $\times$  ca. 600, 4 paraphyses  $\times$  ca. 600, 1 cystidium  $\times$  ca. 300.
- Fig. 10. Ditto: European specimen (Norway, Akershus, Asker-Leangobukten, A. BLYTT, Oct. 18, 1882). 5 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600, 1 cystidium  $\times$  ca. 300.
- Fig. 11. Ditto: North American specimen (Maryland, Herald Harbor, J. A. STEVENSON, Sept. 15, 1935). 5 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.



# Plate X

## Explanation of Plate X

- Fig. 1. *Gloeoglossum glutinosum*: Japanese specimen (Iburi, Lake side of Shikotsu, S. IMAI, Sept. 19, 1931). 1 ascus  $\times$  ca. 300, 5 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.
- Fig. 2. Ditto: European specimen (Germany, Bernau, Chaussee-Rand near Liepnitz-Sees, W. KIRSCHSTEIN, Oct. 24, 1918). 5 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.
- Fig. 3. Ditto: European specimen (*Geoglossum glutinosum* b. *lubricum* PERS., MOUG. et NEST. in Herb. Lugd. Bot. No. 910219-412). 5 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.
- Fig. 4. Ditto: North American specimen (Virginia, Cemetery, Arlington, W. H. LONG, Sept. 28, 1910). 1 ascus  $\times$  ca. 300, 5 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.
- Fig. 5. *Gloeoglossum difforme*: Japanese specimen (Ishikari, Nopporo, S. IMAI, Oct. 15, 1933). 2 asci  $\times$  ca. 300, 4 spores  $\times$  ca. 600, 3 paraphyses  $\times$  ca. 600.
- Fig. 6. Ditto: North American specimen (Maryland, near Cabin John, V. K. CHARLES & E. M. ERMOLD, Sept. 27, 1934). 4 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 600.
- Fig. 7. *Leotia lubrica*: Japanese specimen (Ishikari, Mt. Soranuma, S. IMAI, Sept. 19, 1930). 1 ascus  $\times$  ca. 400, 6 spores  $\times$  ca. 400, 3 paraphyses  $\times$  ca. 400.
- Fig. 8. *Leotia rutilans*: Japanese specimen (Kii, Inari-mura, K. MINAKATA, July 6, 1909). 2 asci containing spores  $\times$  ca. 450, 2 paraphyses  $\times$  ca. 450.
- Fig. 9. *Sarcoleotia nigra*: Japanese specimen (Kushiro, Mt. Meakan, S. IMAI, Sept. 13, 1927). 2 asci  $\times$  ca. 470, 5 spores  $\times$  ca. 470, 1 paraphysis  $\times$  ca. 470.
- Fig. 10. *Spathularia flavida*: Japanese specimen (Shinano, Mt. Kurohime, S. IMAI, Sept. 4, 1938). 1 ascus  $\times$  ca. 300, 5 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 600.
- Fig. 11. Ditto: European specimen (Norway, Christiania, M. N. BLYTT). 4 spores  $\times$  ca. 600, 1 paraphysis  $\times$  ca. 600.
- Fig. 12. Ditto: North American specimen (New York, Ithaca, Coy Glen, J. A. STEVENSON, Aug. 22, 1935). 4 spores  $\times$  ca. 600, 1 paraphysis  $\times$  ca. 600.
- Fig. 13. *Spathularia velutipes*: Japanese specimen (Tosa, Taishō-mura, Oriai, S. IMAI, Oct. 4, 1939). 1 ascus  $\times$  ca. 300, 5 spores  $\times$  ca. 600, 1 paraphysis  $\times$  ca. 600.
- Fig. 14. Ditto: North American specimen (Virginia, near Mountain Lake, Laing Trail, J. A. STEVENSON, Sept. 3, 1936). 6 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 600.
- Fig. 15. *Cudonia circinans*: Japanese specimen (Kōzuke, Katashina-mura, S. IMAI, Oct. 5, 1937). 1 ascus  $\times$  ca. 300, 5 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 300.
- Fig. 16. Ditto: European specimen (Sweden, Uppland, Erentuna, J. A. NANNFELDT, Sept. 3, 1936). 4 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 300.
- Fig. 17. Ditto: North American specimen (Idaho, Priest River, J. R. WEIR, Sept. 1915). 4 spores  $\times$  ca. 600, 1 paraphysis  $\times$  ca. 300.
- Fig. 18. *Cudonia japonica*: Japanese specimen (Rikuzen, Gongen-mori near Sendai, S. IMAI, Oct. 14, 1935). 1 ascus  $\times$  ca. 300, 4 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 300.
- Fig. 19. *Cudonia helvelloides*: Japanese specimen (Ishikari, Nopporo, Y. TOCHINAI & S. IMAI, Sept. 25, 1927). 1 ascus  $\times$  ca. 300, 4 spores  $\times$  ca. 600, 1 paraphysis  $\times$  ca. 300.
- Fig. 20. *Cudonia constrictospora*: Japanese specimen (Ishikari, Nopporo, S. IMAI, Sept. 24, 1923). 3 asci  $\times$  ca. 300, 6 spores  $\times$  ca. 600, 2 paraphyses  $\times$  ca. 300.

