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Gasteromycetes of Chiba Prefecture, Central Honshu, Japan

I. The Family Lycoperdaceae

Taiga Kasuya

College of Agrobiological Resources, University of Tsukuba
Tennodai, Tsukuba, Ibaraki 305-8572, Japan
E-mail: tkasuya@stb.tsukuba-ac.jp

Abstract Twelve species of Lycoperdaceae (Gasteromycetes) collected in Chiba Prefecture, a central area of Japan are reported: *Bovista dryina*, *B. sublaevispora*, *Calvatia excipuliformis*, *Disciseda subterranea*, *Lycoperdon echinatum*, *L. lividum*, *L. mammiforme*, *L. molle*, *L. nigrescens*, *L. perlatum*, *L. pusillum*, and *Vascelum pratense*. Among these species, *B. dryina*, *B. sublaevispora*, *C. excipuliformis*, *L. mammiforme*, *L. molle*, and *L. nigrescens* are newly recorded in Japan.

Key words: *Bovista*, *Calvatia*, Chiba Prefecture, *Disciseda*, *Lycoperdon*, new records, taxonomy, *Vascellum*.

The family Lycoperdaceae (Gasteromycetes) comprises 12 genera and widely distributed in the world. Previously, 25 species belonging to 7 genera were recorded in Japan (Ito, 1959; Imazeki *et al.*, 1988; Yoshimi and Hongo, 1989). Floras of Lycoperdaceae were intensively studied in Africa (Bottomley, 1948; Dissing and Lange, 1962; Dring, 1964), Central Asia (Shvarcman and Filimonova, 1970), Europe (Kreisel, 1962; Demoulin, 1968; Calonge, 1998; Calonge and Demoulin, 1975), North America (Coker and Couch, 1928; Bowerman, 1961), Mexico (Calderón-Villagómez and Pérez-Silva, 1989), and Oceania (Cunningham, 1944). However, flora of this family is far from completed in the Asian temperate areas.

Chiba Prefecture is located in a warm temperate area of central Honshu, Japan. Since the vegetation types are diverse in this region, fungal flora of this area is also considered to be diverse (Fukiharu *et al.*, 1995). Although some species of Lycoperdaceae were fragmentaly reported in several papers on mycological flora of Chiba Prefecture (Kawamura, 1949; Fukiharu *et al.*, 1994; Fukiharu *et al.*, 1995; Koshino and Fukiharu, 1996), this family has not yet been comprehensively studied. During a study on the gasteromycete flora of this prefecture, a number of specimens of Lycoperdaceae in Natural History Museum and Institute, Chiba (CBM) have been examined, and 12 species were recognized. Among them, 6 species are newly recorded from Japan. In this paper, these species were described and illustrated on the basis of the specimens from Chiba Prefecture. A key to the species of the genus *Lycoperdon* are also provided.

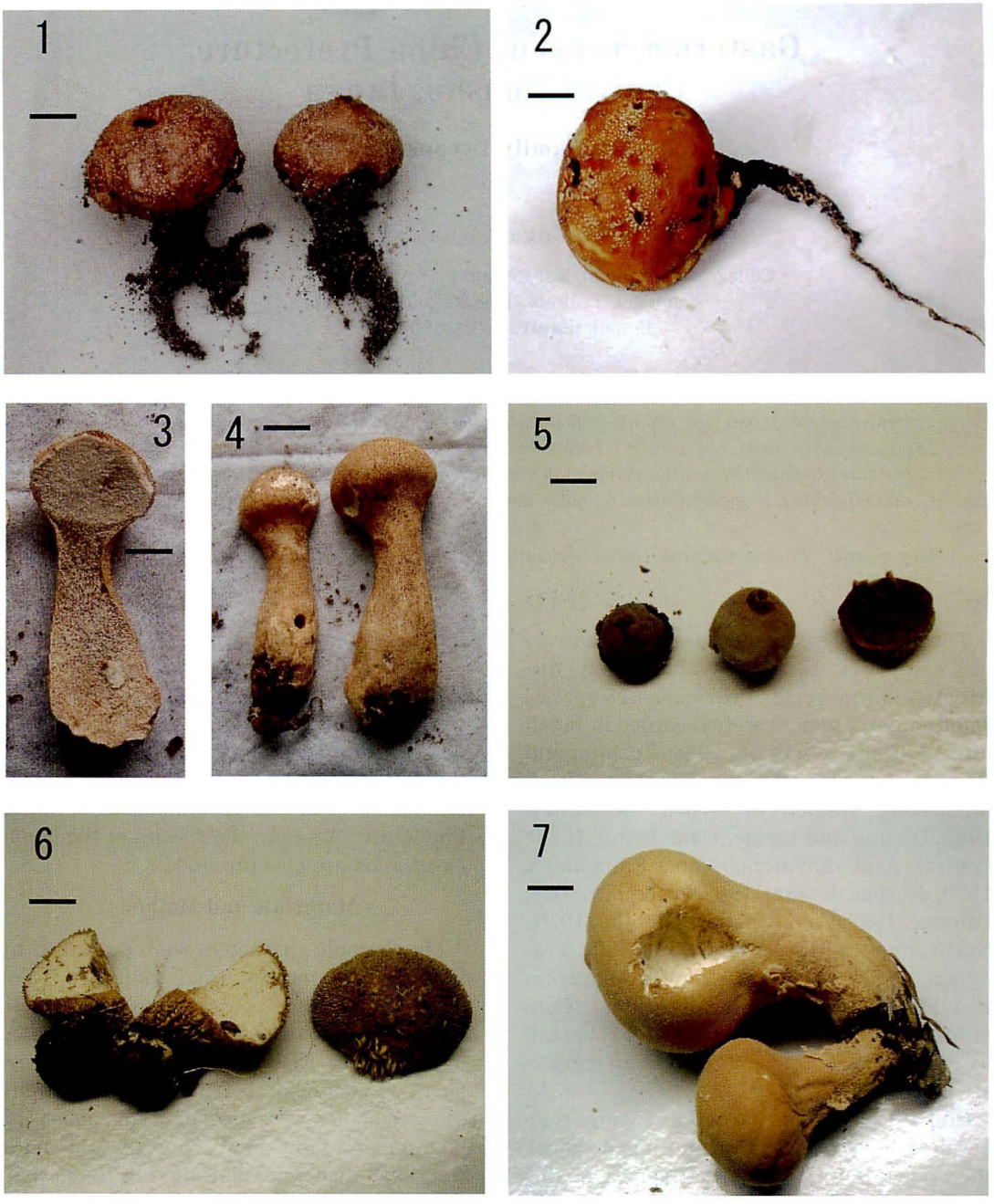
Materials and Methods

Macroscopic characters were described by the observations on dried materials. For light microscopic observations, free-hand sections of gleba and peridium were mounted in water, 5% KOH (w/v), and Melzer's reagent on glass slides. Thirty or 50 randomly selected spores were measured for each specimen under a light microscope. All the materials examined were deposited in the herbarium of the Natural History Museum and Institute, Chiba (CBM).

Taxonomy

Bovista dryina (Morgan) Demoulin, Beih. Sydowia 8: 144, 1979.
Figs. 1, 14A

Basidiomata solitary or in small groups, 18-25 mm broad, subglobose, dark brown, with tough white rhizomorphs at the base,



Figs. 1–7. 1, *Bovista dryina* (Morgan) Demoulin; 2, *B. sublaevispora* Suārez & Wright; 3, *Calvatia excipuliformis* (Pers.: Pers.) Perdeck (sectioned material); 4, *C. excipuliformis*; 5, *Disciseda subterranea* (Peck) Coker & Couch; 6, *Lycoperdon echinatum* Pers.: Pers.; 7, *L. lividum* Pers. Scale bars 1, 3, 6–7: 10 mm; 2, 5: 7 mm; 4: 15 mm.

opening with an apical pore 3–5 mm wide. Exoperidium made up of yellowish brown to grey brown warts, later sloughing off. Endoperidium papery, reddish brown to dark brown. Gleba yellowish brown to olivaceous brown. Subgleba present, compact, olivaceous brown.

Basidiospores globose to subglobose,

smooth or minutely verrucose, warts up to 0.5 μm high, 4.0–5.5 μm broad excluding ornaments or 4.5–5.0 μm broad including ornaments, with or without short pedicels up to 1 μm long. Basidia not observed. Capillitium *Lycoperdon*-type, elastic, brown, up to 6.0 μm broad, walls 1.0–1.5 μm broad, without pores, rarely with dichotomous branches.

Habitat: On sandy soil or rich soil among grass. Usually outside the woodlands.

Distribution: Japan (Chiba), Canada (Bowerman, 1961), United States (Demoulin, 1979), Ecuador (Lloyd, 1906 as *Lycoperdon septimum* Lloyd), Venezuela (Kreisel, 1967 as *B. colorata* (Peck) Kreisel), and Canary Islands (Tejera *et al.*, 1998).

Specimen examined: Chiba Pref., Futtsu-shi, Shin-maikohama, growing on the sand dune along coast, June 7, 2003, coll. I. Asai s.n. (CBM-FB-33729).

Japanese name: Hamabe-dangotake (newly named).

Remarks: This species is newly reported here from Japan. It is characterized by non-poroid, rarely branched capillitium, and smooth or minutly verrucose basidiospores with or without a short pedicel.

Bovista sublaevispora V. L. Suārez & J. E. Wright, Mycotaxon 50: 284, 1994.
Figs. 2, 14B

Basidiomata solitary or in small groups, 20 mm broad, subglobose, ochraceous to dark brown, with tough rhizomorphs at the base, opening with an apical pore up to 4 mm wide. Exoperidium made up of thin, whitish to pale yellowish verrucae, later sloughing off. Endoperidium papery, reddish brown to bronze-coloured, smooth. Gleba light brown to yellowish brown, powdery. Subgleba yellowish brown, not prominent, compact.

Basidiospores globose, smooth, 4.5–5.0 μm broad, without pedicels. Basidia not observed. Capillitium *Bovista*-type, brown, up to 6.0–30.0 μm, walls 3.0–3.5 μm broad, without pores, septa, and pseudosepta, branching dichotomously, principal branches 7.0–25.0 μm in diameter, terminal branches 1.0–2.0 μm in diameter.

Habitat: On sandy soil among grass.

Distribution: Japan (Chiba), and Chile (Suārez and Wright, 1994).

Specimen examined: Chiba Pref., Futtsu-shi, Shin-maikohama, growing on the sand dune along coast, June 21, 2003, coll. I. Asai s. n. (CBM-FB-33847).

Japanese name: Marumi-no-dangotake (newly named).

Remarks: This species is newly reported here from Japan. *Bovista sublaevispora* is characterized by smooth, non-pedicel basidiospores, and *Bovista*-type capillitium without pores. This species is morphologically similar to *B. coprophila* (Cooke & Massee) G. H. Cunn., but basidiospores of *B. coprophila* are verrucose and with short pedicels (Kreisel, 1967). *Bovista fulva* Massee also has smooth basidiospores, but with long pedicels (Kreisel, 1967). Japanese material of *B. sublaevispora* has whitish to pale yellowish exoperidium, but characteristics of basidiospores and capillitium were identical with those in the original description (Suārez and Wright, 1994).

Calvatia excipuliformis (Pers.: Pers.) Perdeck, Blumea 6: 490, 1950.
Figs. 3, 4, 14C

Basidiomata low turbinate to high stipitum, 40–150 mm high, 15–40 mm broad, pale ochraceous to brown, with white rhizomorphs up to 4 cm long. Exoperidium made of clusters of spines, fragile, furfuraceous, dull white to grey or greyish brown, sometimes mixed with greyish brown warts. Endoperidium soft, brittle, cream to fawn. Gleba compact, white when young, later yellowish brown to chocolate brown. Subgleba well developed, prominent, spongy, white to pale greyish white.

Basidiospores globose, warty, warts up to 0.5 μm high, (5.5–) 6.0–7.0 μm in diameter excluding ornaments or (6.0–) 6.5–7.5 (–8.0) μm in diameter including ornaments, yellowish brown, with a hyaline pedicel, 2.5–4.0 μm long. Basidia not observed. Capillitium 2.5–5.5 μm broad, walls 0.5–1.5 μm thick, occasionally branched, yellowish brown, pores small, rounded or irregular.

Habitat: On rich soil in woodlands or among grass.

Distribution: Japan (Chiba), China (Liu, 1984), Thailand (Dissing, 1963), Kazakhstan (Shvarcman and Filimonova, 1970), Europe

(Demoulin, 1983; Kreisel, 1989; Lange, 1990), Canada (Kreisel, 1989), United States (Kreisel, 1989), and Brazil (Baseia, 2003).

Specimen examined: Chiba Pref., Chiba-shi, Midori-ku, Noro-cho, on the ground in a mixed forest, October 23, 1993, coll. Chiba Mycol. Club s.n. (CBM-FB-9739).

Japanese name: Seitaka-noutake (newly named).

Remarks: This species is newly reported here from Japan. The macro- and microscopic characteristics of the Japanese material are identical with the description of *C. excipuliformis* given by Kreisel (1989) due to the high stipitum basidiomata, prominently warted basidiospores, and ruptured capillitium. It is distinguished from other 6 species of *Calvatia* reported from Japan by the well developed subgleba, and prominently warty basidiospores. Kreisel (1989) described the genus *Handkea* for those with slit-like pores in capillitium, and proposed the combination *H. excipuliformis* (Pers.: Pers.) Kreisel. However, this genus is not distinguished clearly from *Calvatia* (Calonge and Martin, 1990), and *Handkea* is treated as a synonym of *Calvatia* (Moyersoen and Demoulin, 1996).

Disciseda subterranea (Peck) Coker & Couch, The Gasteromycetes of eastern United States and Canada: 141, 1928.
Figs. 5, 14D

Basidiomata in small groups, globose to depressed globose, 7–15 mm broad, grey brown to dark brown. Exoperidium thin, brittle, dark brown, fallen away except for the basal area leaving a cup-shaped remaining at maturity, encrusted with sand. Endoperidium white to pale brown, papery, pulverulent, tough, opening with an apical pore up to 2 mm wide. Gleba olivaceous brown, powdery. Subgleba absent.

Basidiospores globose, warty, warts up to 1.5 μm high, 4.5–6.5 μm broad excluding ornaments or 6.0–7.5 μm broad including ornaments, with short pedicels up to 1.0–1.5 μm long, yellowish to olivaceous brown. Basidia not observed. Capillitium smooth, without pores, septa, and pseudosepta, usually cincinnate, breaking into short particles, walls 2.0–4.5 μm thick.

Habitat: On sandy soil among grass.

Distribution: Japan, Canada, and United States (Coker and Couch, 1928).

Specimen examined: Chiba Pref., Sousa-gun, Hasunuma-mura, Minamihama, growing on the sand dune along coast, February 6, 2003, coll. I. Asai s.n. (CBM-FB-33730).

Japanese name: Donguritake.

Remarks: This species was previously known only from Aichi Prefecture in Japan (Yoshimi and Hongo, 1989). *Disciseda candida* (Schwein.) Lloyd is morphologically similar to *D. subterranea* though *D. candida* has larger basidiomata up to 20–35 mm broad, and smaller basidiospores 4.0–5.0 μm broad (Kers, 1975). *Disciseda subterranea* also resembles *D. bovista* (Klotzsch) Hennings because of its features of endoperidium and warty basidiospores, but the latter has larger basidiospores (6.0–9.0 μm broad) than the former (Kers, 1975).

Lycoperdon echinatum Pers.: Pers., Synops. Meth. Fung.: 147, 1801.
Figs. 6, 14E

Basidiomata solitary or in small groups, 25–40 mm broad, 30–35 mm high, subglobose to subpyriform, brown to dark brown. Exoperidium made up of dense spines, white when young, later becoming brown to dark brown, 3–5 mm long. Endoperidium thin, papery, pale brown to brown, showing polygonal pattern after endoperidium sloughing off. Gleba olivaceous brown, with pseudocolumella. Subgleba present, ochraceous to brown.

Basidiospores globose, verrucose, warts up to 1.0 μm high, 3.5–5.0 μm broad excluding ornaments or 5.0–6.0 μm broad including ornaments, with long pedicels usually breaking into short particles. Basidia not observed. Capillitium *Lycoperdon*-type, elastic, occasionally branched, sinuous, with pitted walls, 4.5–5.5 μm broad. Paracapillitium absent.

Habitat: On rich soil or humus in woodlands.

Distribution: Japan, China (Liu, 1984), Mongolia (Dorfelt and Bumzaa, 1986), Europe (Kreisel, 1962), South Africa (Bottomley, 1948), Australia (Cunningham, 1944), Canada (Bowerman, 1961), and United States (Coker and Couch, 1928).

Specimen examined: Chiba Pref., Chosei-

gun, Chonan-machi, Mizunuma, growing on the ground in mixed forest, October 30, 1994, coll. K. Osaku s.n. (CBM-FB-10322).

Japanese name: Arage-hokoritake.

Remarks: This species often occurs with *Lepiota* spp. (Pegler *et al.*, 1995). *Lycoperdon caudatum* J. Schröt. also has long pedicellate basidiospores, but the pedicels of *L. caudatum* are longer (15–35 μm long) than those of *L. echinatum* (5.0–20.0 μm long, Pegler *et al.*, 1995).

Lycoperdon lividum Pers., J. Bot., Paris 2: 18, 1809.
Figs. 7, 14F

Basidiomata solitary or in small groups, 25–30 mm broad, 30–50 mm high, pyriform, yellow to ochraceous. Exoperidium made up of scurfy, furfuraceous spines, yellow to pale brown, later sloughing off. Endoperidium yellow to ochraceous brown, thin, papery, opening with an apical pore up to 3–5 mm wide. Gleba ochraceous to brown, powdery. Subgleba well developed, spongy, white to ochraceous.

Basidiospores globose to subglobose, minutely verrucose, warts up to 0.5 μm high, 3.5–4.0 μm broad excluding ornaments or 4.0–4.5 μm broad including ornaments, pale ochraceous, with short pedicels up to 1.0–2.0 μm long. Basidia not observed. Capillitium *Lycoperdon*-type, walls 2.0–3.0 μm thick, aseptate, dichotomously branched, with pits in the walls.

Habitat: On sandy soil or rich soil among grass in woodlands.

Distribution: Japan, Israel (Dring and Rayss, 1963), Europe (Kreisel, 1962; Calonge and Demoulin, 1975), Canada (Coker and Couch, 1928; Bowerman, 1961), United States (Coker and Couch, 1928), and Mexico (Pérez-Silva *et al.*, 1994).

Specimen examined: Chiba Pref., Chiba-shi, Midori-ku, Kasori-cho, October 10, 1994, coll. K. Osaku s.n. (CBM-FB-12016).

Japanese name: Ki-hokoritake.

Remarks: Previously, this species was reported as *L. spadiceum* Pers. in Japan (Yoshimi and Hongo, 1989). However, *L. spadiceum* is considered a synonym of *L. lividum* because both have yellowish peridium and similar basidiospores and capillitium (Ortega *et al.*, 1985; Pegler *et al.*, 1995).

Lycoperdon mammiforme Pers., Synops. Meth. Fung.: 146, 1801.
Figs. 8, 14G

Basidiomata in small groups, pyriform to subpyriform, 25–35 mm broad, 30–50 mm high, white to cream. Exoperidium made up of minutely spinulose, covered with flaky veil, white or cream to pinkish. Endoperidium papery, shiny, olivaceous brown to bronze coloured. Gleba olivaceous to dark brown, with indistinct pseudocolumella. Subgleba well developed, spongy, ochraceous to olivaceous brown.

Basidiospores globose to subglobose, verrucose, warts up to 1.0 μm high, 3.5–5.0 μm broad excluding ornaments or 4.5–6.0 μm broad including ornaments, with pedicels up to 15.0 μm long. Basidia not observed. Capillitium elastic, with scattered small pores in walls, dichotomously branched, walls 1.0–1.5 μm thick. Paracapillitium absent.

Habitat: On rich soil or humus in deciduous forests.

Distribution: Japan (Chiba), China (Eckblad and Ellingsen, 1984), and Europe (Kreisel, 1962; Calonge and Demoulin, 1975).

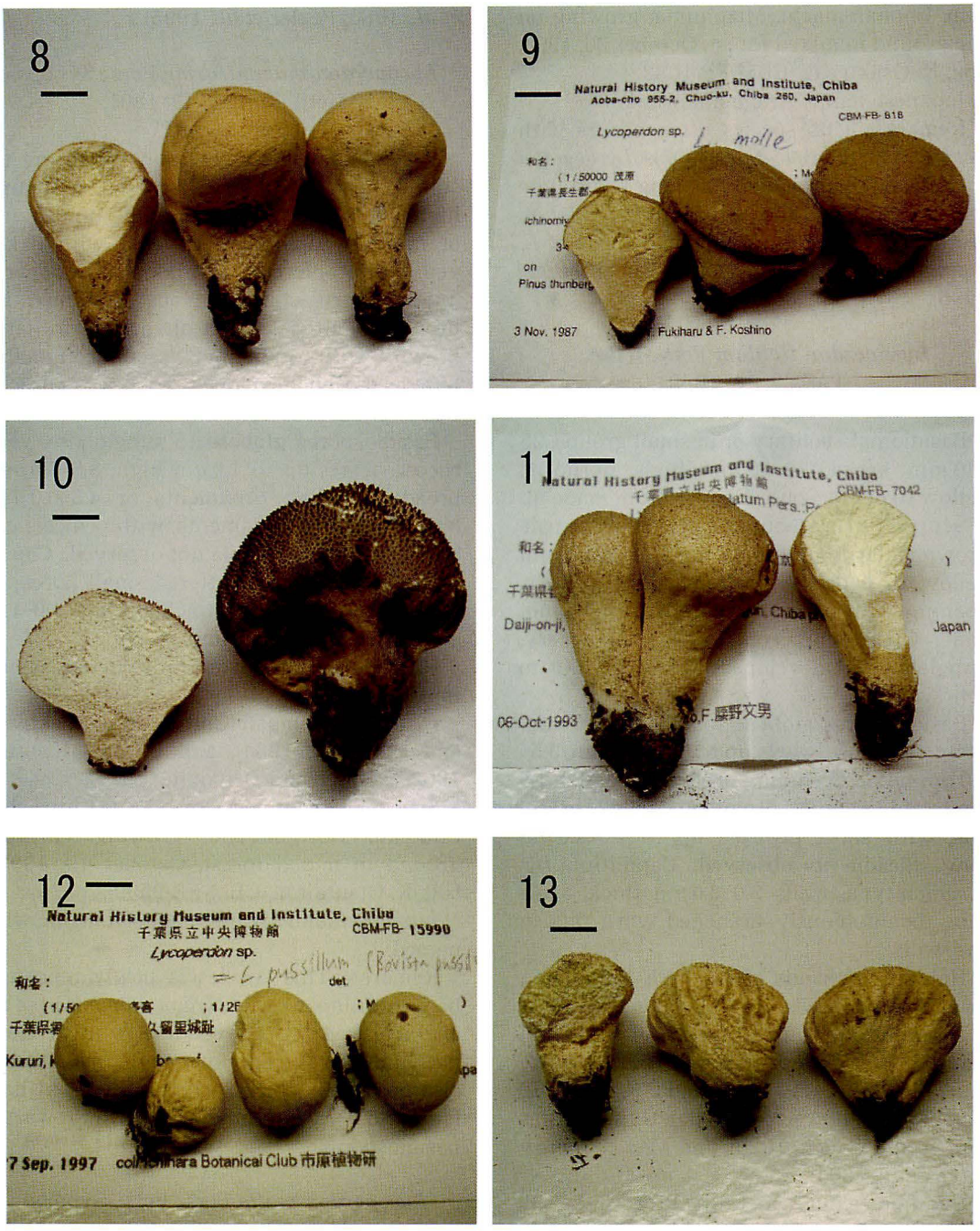
Specimen examined: Chiba Pref., Chiba-shi, Chuo-ku, Hosiguki-cho, growing on the ground in mixed forest, October 19, 1993, coll. K. Otsuta s.n. (CBM-FB-9592).

Japanese name: Watage-hokoritake (newly named).

Remarks: This species is newly reported here from Japan. *Lycoperdon mammiforme* is characterized by its veil-like whitish exoperidium. Young specimens of *L. molle* Pers. also has flaky whitish exoperidium, but has larger (5.0–7.0 μm in diameter) and warty basidiospores.

Lycoperdon molle Pers.: Pers., Synops. Meth. Fung.: 150, 1801.
Figs. 9, 14H

Basidiomata in small groups, turbinate to subpyriform, 15–30 mm broad, 15–40 mm high, white to greyish brown, with narrow rhizomorphs at the base. Exoperidium made up of soft, thin, cream to greyish brown, fragile spines with minute granules. Endoperidium papery, cream to pale brown. Gleba



Figs. 8–13. 8, *Lycoperdon mammiforme* Pers.; 9, *L. molle* Pers.: Pers.; 10, *L. nigrescens* Pers.; 11, *L. perlatum* Pers.: Pers.; 12, *L. pusillum* Batsch: Pers.; 13, *Vascelum pratense* (Pers. emend. Quel.) Kreisel. Scale bars 8, 11–12: 10 mm; 9: 12 mm; 10, 13: 7 mm.

olivaceous to chocolate brown, powdery, with indistinct pseudocolumella. Subgleba present, alveolate, greyish brown to olivaceous brown.

Basidiospores globose, verrucose, warts up to 0.5 μm high, 4.0–5.0 μm broad excluding ornaments or 4.5–5.5 μm broad including ornaments, with short pedicels. Basidia not

observed. Capillitium elastic, 4.0–8.0 μm broad, walls 1.0–1.5 μm thick, sometimes dichotomously branched, pores abundant. Paracapillitium absent.

Habitat: On soil in woodlands or among grass.

Distribution: Japan (Chiba), China (Eckblad and Ellingsen, 1984; Liu, 1984), Mongolia (Dorfelt and Bumzaa, 1986), Thailand (Dissing, 1963), Europe (Kreisel, 1962; Calonge and Demoulin, 1975), South Africa (Bottomley, 1948), Canada (Bowerman, 1961), and United States (Coker and Couch, 1928).

Specimen examined: Chiba Pref., Chosei-gun, Ichinomiya-machi, Torami, growing on the ground under *Pinus* spp., November 3, 1987, coll. T. Fukiharu s.n. (CBM-FB-818).

Japanese name: Koge-hokoritake (newly named).

Remarks: This species is newly reported here from Japan. *Lycoperdon frigidum* Demoulin is closely related to *L. molle* because of its features of exoperidium, but the former occurs in tundra often associated with *Dryas* spp. Furthermore, its basidiospores are larger (4.5–6.5 μm broad) and smooth (Demoulin, 1972). *Lycoperdon molle* is a common species in the Northern Hemisphere (Kreisel, 1962; Pegler *et al.*, 1995).

Lycoperdon nigrescens Wahlenb.: Pers., Synops. Meth. Fung.: 146, 1801.
Figs. 10, 14I

Basidiomata in small groups or solitary, subglobose to subpyriform, 15–25 mm broad, 20–35 mm high, dark brown to black. Exoperidium pale brown or dark brown to black, made up of 1–2.5 mm long, cylindrical to conical spines. Endoperidium papery, cream to ochraceous. Gleba ochraceous brown to olivaceous brown, powdery, with well developed pseudocolumella. Subgleba spongy, olivaceous to brown.

Basidiospores globose to subglobose, verrucose, warts up to 0.5 μm high, 3.5–4.5 μm broad excluding ornaments or 4.0–5.0 μm broad including ornaments, with short pedicels up to 2.0–3.0 μm long. Basidia not observed. Capillitium elastic, with many pores, 6.0–-8.5 μm broad, walls 1.0–1.5 μm thick, sometimes branched. Paracapillitium usually present.

Habitat: On soil in woodlands or among grass.

Distribution: Japan (Chiba), Australia (Cunningham, 1944), Europe (Kreisel, 1962; Calonge and Demoulin, 1975), South Africa (Bottomley, 1948), Canada (Bowerman and Groves, 1962), and Unated States (Coker and Couch, 1928).

Specimen examined: Chiba Pref., Funabashi-shi, Ojinbo-cho, growing on the ground in mixed forest, October 12, 1992, coll. Sakura Bot. Club s.n. (CBM-FB-4616).

Japanese name: Kuro-hokoritake (newly named).

Remarks: This species is newly reported here from Japan. Walls of capillitium of the Japanese specimen are thicker than that of European materials (Kreisel, 1962; Calonge and Demoulin, 1975; Pegler *et al.*, 1995), but other characters are identical with those in previous descriptions of *L. nigrescens* (Bowerman and Groves, 1962; Kreisel, 1962; Calonge and Demoulin, 1975). *Lycoperdon norvegicum* Demoulin, an arctic and alpine species has blackish exoperidial spins, but it has smaller (3.0–4.0 μm broad) and smooth basidiospores (Demoulin, 1971). Characters of basidiospores and capillitium of *L. nigrescens*. var. *peckii* (Morgan) Demoulin is also similer to *L. nigrescens*, but its exoperidium is usually cream, and becoming dark brown rarely.

Lycoperdon perlatum Pers.: Pers., Synops. Meth. Fung.: 145, 1801.
Figs. 11, 12J

Basidiomata in small groups or gregarious, 20–50 mm broad, 20–40 mm high, subglobose to subpyriform, greyish brown to brown. Exoperidium made of fragile, conical spines, 1–2 mm long, white or cream to pale brown, later sloughing off, surrounded by a persistent warts. Endoperidium papery, greyish brown. Gleba white when young, later olivaceous brown, with well developed pseudocolumella. Subgleba well developed, spongy, olivaceous brown to greyish brown.

Basidiospores globose to subglobose, verrucose, warts up to 1.0 μm high, (3.0–) 4.0–5.0 μm broad excluding ornaments or (4.0–) 5.0–6.0 μm broad including ornaments, olivaceous, with pedicels up to 2.0–5.0 μm long. Basidia not observed. Capillitium *Lycoper-*

don-type, 3.0–6.0 μm broad, elastic, non-septate, sometimes dichotomously branched, pores abundant. Paracapillitium usually abundant.

Habitat: On soil or humus in woodlands or among grass.

Distribution: Very common in Japan. Cosmopolitan.

Specimens examined: Chiba Pref., Awa-gun, Amatsukominato-machi, Mt. Kiyosumi, October 22, 1987, coll. T. Fukiharu s.n. (CBM-FB-770); same place, November 6, 1987, coll. T. Fukiharu s.n. (CBM-FB-863); same place, October 21, 1989, coll. A. Suzuki s.n. (CBM-FB-2525 and 2527); Chiba Pref., Chosei-gun, Ichinomiya-machi, Gundari-san, October 4, 1987, coll. Chiba Biol. Soc. s.n. (CBM-FB-578); Chiba Pref., Chosei-gun, Ichinomiya-machi, October 27, 1987, coll. F. Koshino s.n. (CBM-FB-750); same place, November 3, 1987, coll. T. Fukiharu s.n. (CBM-FB-817); same place, May 18, 1996, coll. Y. Okubo s.n. (CBM-FB-14632); Chiba Pref., Chosei-gun, Chonan-machi, Mizunuma, May 5, 1994, coll. K. Osaku s.n. (CBM-FB-10334); Chiba Pref., Kimitsu-shi, Honoki, October 15, 1987, coll. T. Fukiharu s.n. (CBM-FB-661); Chiba Pref., Ichihara-shi, Kikuma, October 7, 1996, coll. K. Hayashi s.n. (CBM-FB-15332); Chiba Pref., Ichihara-shi, Okubo, October 19, 1988, coll. F. Koshino s.n. (CBM-FB-1273); Chiba Pref., Ichihara-shi, Tsukizaki, October, 10, 1992, coll. Ichihara Bot. Club s.n. (CBM-FB-4553); same place, May 22, 1994, coll. K. Osaku s.n. (CBM-FB-11067); same place, October, 15, 1994, coll. Chiba Mycol. Club s.n. (CBM-FB-12217); Chiba Pref., Chiba-shi, Heiwa Park, October 14, 1993, coll. K. Otsuta s.n. (CBM-FB-9569); same place, November 5, 1994, coll. K. Osaku s.n. (CBM-FB-10341); Chiba Pref., Chiba-shi, Midori-ku, Noro-cho, July 24, 1993, coll. Chiba Mycol. Club s.n. (CBM-FB-5879); same place, October 12, 1996, coll. Chiba Mycol. Club s.n. (CBM-FB-15432); Chiba Pref., Chiba-shi, Midori-ku, Hirayama-cho, October 12, 1993, coll. F. Koshino s.n. (CBM-FB-9537); Chiba Pref., Narashino-shi, Saginuma, December 3, 1998, coll. Y. Mikanagi s.n. (CBM-FB-24410); Chiba Pref., Funabashi-shi, Ojinbo-cho, October 9, 1994, coll. K. Osaku s.n. (CBM-FB-11598); same place, October 16, 1994, coll. K. Osaku s.n. (CBM-FB-12254); same place, October 29, 1995, coll. Y. Sada s.n. (CBM-FB-14486); same place, October 19, 1996, coll. K. Osaku s.n. (CBM-FB-17280); same place, October 14, 2000, coll. Chiba Mycol. Club s.n. (CBM-FB-30029); Chiba Pref., Sakura-shi, Iino, October 27, 1996, coll. Sakura Bot. Club s.n. (CBM-FB-15622); Chiba Pref., Imba-gun, Sakae-machi, Ryukakuji, October 22, 1989, coll. Chiba Mycol. Club s.n. (CBM-FB-6067 and 6069); same place, October, 6, 1991, coll. Y. Horie s.n. (CBM-FB-6060 and 6054); same place, October, 11, 1992, coll. Chiba Mycol. Club s.n. (CBM-FB-4572); Chiba Pref., Katori-gun, Taiei-machi, Yoshioka, October 6, 1993, coll. F. Koshino s.n. (CBM-FB-7042).

Japanese name: Hokoritake.

Lycoperdon pusillum Batsch, Elench. Fung. 2: 124, 1789.
Figs. 12, 14K

Basidiomata in small groups or gregarious, 15–30 mm broad, globose to subglobose, white or yellowish white to pale brown, with well developed white rhizomorphs at the base. Exoperidium made of minutely, furfuraceous squamules, white to pale ochraceous, sloughing off at maturity. Endoperidium white to pale brown, membranous, papery, thin, smooth, opening with an apical pore up to 5 mm wide. Gleba yellowish to brown. Subgleba absent.

Basidiospores globose, smooth or minutely verrucose, warts up to 0.5 μm high, 3.5–4.0 μm broad excluding ornaments or 4.0–4.5 μm broad including ornaments, with short pedicels up to 2 μm long. Capillitium *Lycoperdon*-type, 3.0–4.5 μm broad, usually dichotomously branched, poroid.

Habitat: On soil or humus among grass.

Distribution: Common in Japan. Cosmopolitan.

Specimen examined: Chiba Pref., Kimitsu-shi, Kururi, September 27, 1997, coll. Ichihara Bot. Club s.n. (CBM-FB-15990).

Japanese name: Chibi-hokoritake.

Key to the species of *Lycoperdon* collected in Chiba Prefecture

1. Basidiomata without subgleba, white to pale brown, with long rhizomorphs, basidiospores smooth to minutely verrucose ..... ***L. pusillum***

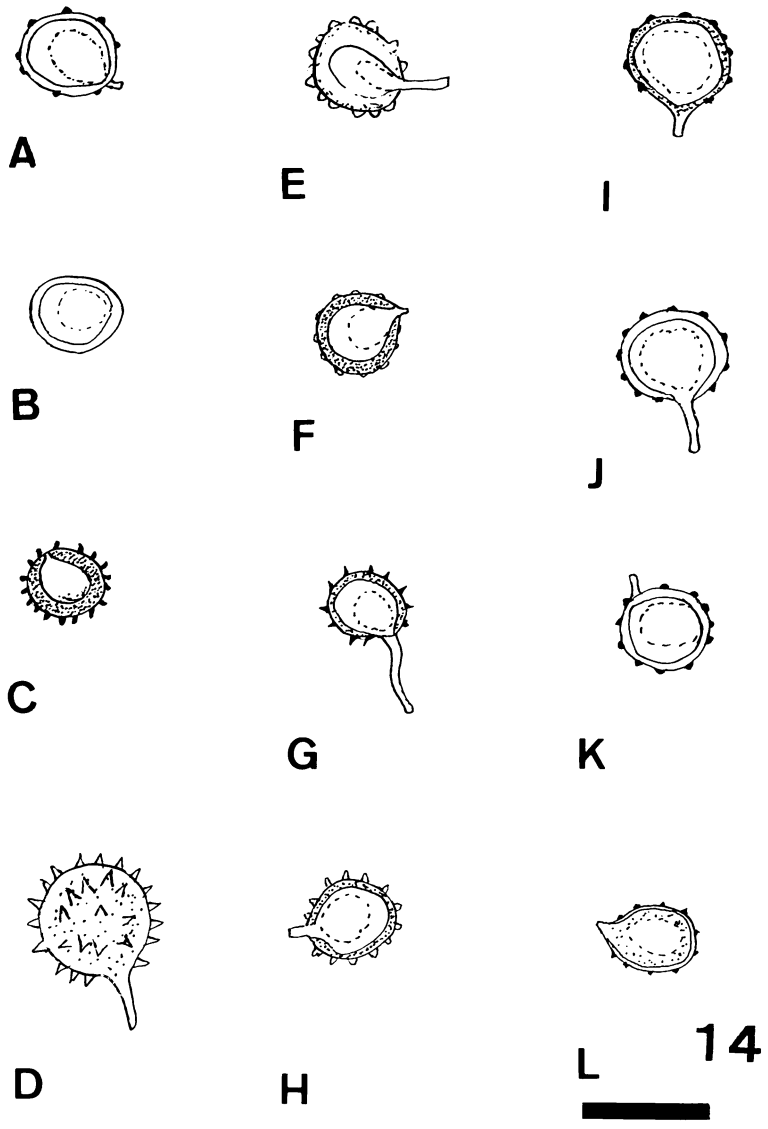


Fig. 14. Basidiospores. A, *Bovista dryina*; B, *B. sublaevispora*; C, *Calvatia excipuliformis*; D, *Disciseda subterranea*; E, *Lycoperdon echinatum*; F, *L. lividum*; G, *L. mammiforme*; H, *L. molle*; I, *L. nigrescens*; J, *L. perlatum*; K, *L. pusillum*; L, *Vascelum pratense*. Scale bar: 7 μm.

1′. Basidiomata with developed subgleba 2
2. Basidiomata with white or cream to pinkish exoperidium made of minute spines with flaky veil .....***L. mammiforme***
2′. Basidiomata unveiled, with areolate pattern from shed exoperidium 3
3. Exoperidial spines dark brown, 3–5 mm long, basidiospores with prominent ornamentation and long pedicels .....***L. echinatum***
3′. Exoperidial spines shorter, basidiospores with indistinctive ornamentation 4
4. Basidiomata grey brown to black 5
4′. Basidiomata not above coloured 6
5. Basidiomata grey brown to brown; exoperidial spines leaving not prominent areolate pattern.....***L. perlatum***
5′. Basidiomata dark brown to black, exoperidial spines leaving prominent areolate pattern .....***L. nigrescens***
6. Basidiomata usually yellow to ochra-

ceous, basidiospores minutely verrucose, 3.5–4.0 μm broad; in dried, and open habitats or woodlands . . ***L. lividum***

6′. Basidiomata white to greyish brown, basidiospores warty, 4.0–5.0 μm broad; in woodlands or among grass . . ***L. molle***

Vascellum pratense (Pers.: Pers.) Kreisel, Feddes Repert. 64: 159, 1962.
Figs. 13, 14L

Basidiomata in small groups, broadly turbinate, 10–35 mm in diameter, white to yellowish brown. Exoperidium made up of white, numerous stellate spines and granules, later sloughing off. Endoperidium ochraceous to brown, papery, usually opening with an apical pore up to 2–3 mm wide. Gleba pallid olivaceous, powdery. Subgleba present, separeted from the gleba by a well developed diaphragm, ochraceous to pallid olivaceous.

Basidiospores globose, minutely verrucose, warts up to 0.5 μm high, 3.5–4.5 μm broad excluding ornaments or 4.0–4.5 μm broad including ornaments, pale olivaceous brown, with inconspicuous pedicels up to 1.5–2.0 μm long. Basidia not observed. Capillitium *Lycoperdon*-type, restricted near endoperidial wall, 3.0–4.5 μm broad, non-poroid. Paracapillitium abundant, septate, rarely branched, 2.0–5.5 μm broad.

Habitat: Usually on soil among grass. Usually outside the woodlands.

Distribution: Common in Japan. Cosmopolitan.

Specimen examined: Chiba Pref., Chiba-shi, Chuo-ku, Aoba-cho, July 9, 1995, coll. R. Onuma s.n. (CBM-FB-12905).

Japanese name: Hime-hokoritake.

Remarks: The genus *Vascellum* is characterized by the presence of a well developed diaphragm between gleba and subgleba.

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千葉県の腹菌類. I. ホコリタケ科

糟谷大河

筑波大学生物資源学類
〒305-8572 つくば市天王台 1-1-1
E-mail: tkasuya@stb.tsukuba-ac.jp

千葉県立中央博物館に収蔵されている，千葉県産ホコリタケ科菌類標本について分類学的検討を行った．その結果，以下の 12 種が同定された：*Bovista dryina*（ハマベダンゴタケ，新称），*B. sublaevispora*（マルミノダンゴタケ，新称），*Calvatia excipuliformis*（セイタカノウタケ，新称），*Disciseda subterranea*（ドングリタケ），*Lycoperdon echinatum*（アラゲホコリタケ），*L. lividum*（キホコリタケ），*L. mammiforme*（ワタゲホコリタケ，新称），*L. molle*（コゲホコリタケ，新称），*L. nigrescens*（クロホコリタケ，新称），*L. perlatum*（ホコリタケ），*L. pusillum*（チビホコリタケ），*Vascelum pratense*（ヒメホコリタケ）．これらのうち，*B. dryina*, *B. sublaevispora*, *C. excipuliformis*, *L. mammiforme*, *L. molle*, および *L. nigrescens* は日本新産種である．