

SHORT COMMUNICATION

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## *Veligaster nitidum*, a pantropical sclerodermataceous fungus new to Japan and Thailand

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**Abstract** *Veligaster nitidum* is newly recorded from Japan and Thailand. Macroscopic and microscopic features of the species are described and illustrated based on the Japanese and Thai specimens.

**Key words** Evergreen broad-leaved forest · New record · Sclerodermataceae

The pantropical fungal genus *Veligaster* Guzmán is morphologically characterized by the subgelatinous patches of the exoperidium, both on the base of the globose part of the basidioma and on the upper part of the well-developed stipe (Guzmán 1969; Guzmán and Tapia 1995). Six species of this genus are hitherto known from tropical to subtropical areas of Africa, Asia, and the Neotropics (Guzmán 1969; Guzmán and Tapia 1995; Guzmán et al. 1997, 2004; Guzmán and Ovrebø 2000). Recently, while examining the stipitate collections of Asiatic sclerodermataceous fungi, we recognized *Veligaster nitidum* (Berk.) Guzmán & Tapia from Japan and Thailand. This species is a new record for those countries. In this article, we describe and illustrate morphological characters of *V. nitidum* based on the Japanese and Thai specimens, and also compare the present species with some related taxa.

The specimens examined in this study are deposited in the herbarium of the National Science Museum, Tokyo (TNS). Macroscopic characters were described by observations on dried materials under a stereomicroscope. For light microscopic observations, free-hand sections of peridium and gleba were mounted in water, 1% cotton-blue lactophe-

nol, and 5% KOH solution on glass slides. Forty randomly selected basidiospores were measured under a light microscope at 1000× magnification. The surface features of basidiospores were also observed by scanning electron microscopy (SEM). For SEM, gleba were dusted onto specimen holders attached with double-sided adhesive tape and then coated with platinum-palladium with an E-1030 Ion Sputter Coater (Hitachi, Tokyo, Japan). They were examined with a S-4200 SEM (Hitachi, Tokyo, Japan) operating at 20.0kV.

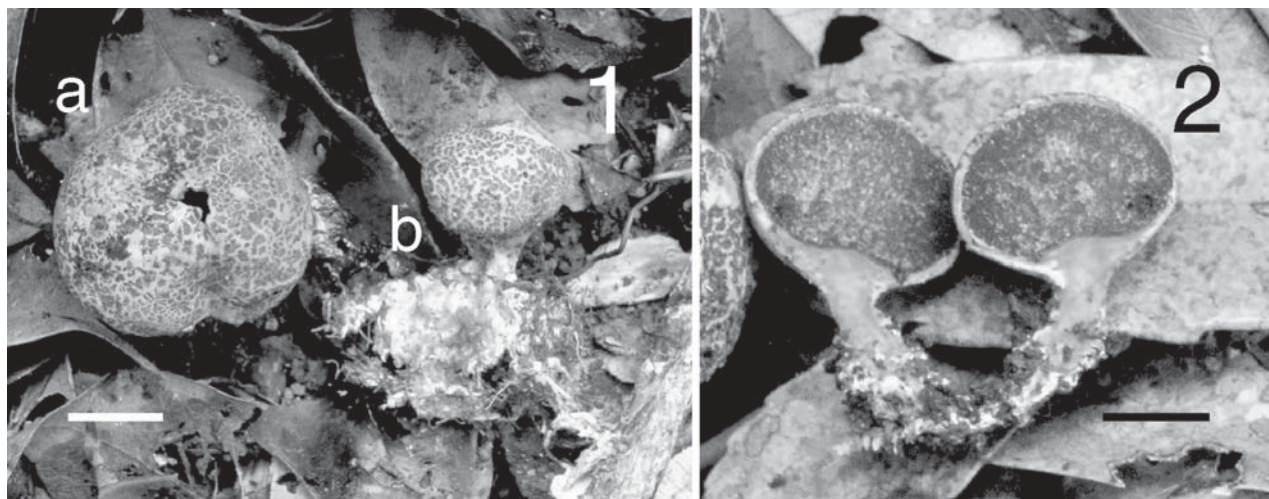
*Veligaster nitidum* (Berk.) Guzmán & Tapia, Doc. Mycol. 25:188, 1995. Figs. 1–8

≡ *Scleroderma nitidum* Berk., Kew J. Bot. 6:173, 1854.

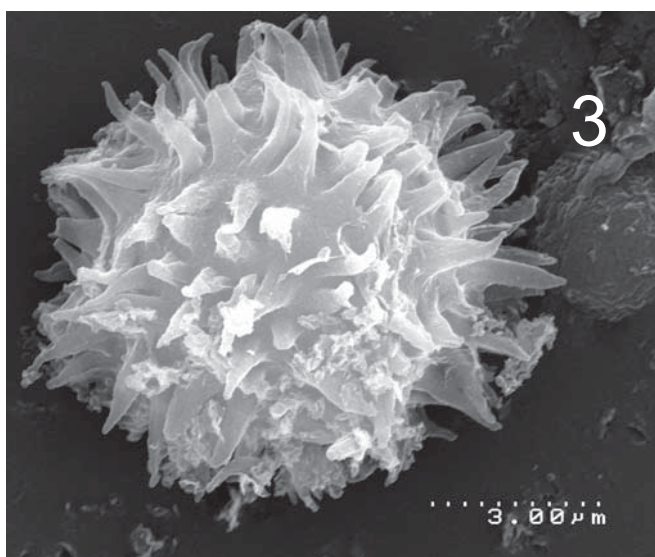
Basidiomata 20–45 mm high, 10–30 mm broad in the globose part, with a well-developed, solid, cylindrical or irregularly flattened, frequently lacunose stipe with conspicuous white mycelial strands at its base. Peridium divided into two layers, rubescent to vinaceous red mainly when cut. In dried specimens, peridium staining pale brownish red in KOH. Exoperidium smooth to soon irregularly cracked in small, fairly close, yellowish brown to dark brown, 1–2 mm broad, depressed scales, but as dark subgelatinous patches on the base of the globose part of the basidiomata and on the stipe, mainly in the upper part, a feature difficult to observe in very young or old specimens. Exoperidium at apex of globose part of basidioma composed of erect or semierect, septate, thick-walled, yellowish filamentous hyphae 2.5–6 μm thick; the subgelatinous patches composed of interwoven, septate, thin-walled, hyaline to yellowish brown, gelatinized filamentous hyphae 1–2.5 μm thick. Endoperidium thin, whitish to yellowish when seen between the squamules of the exoperidium. Endoperidium composed of interwoven, septate, thin-walled, hyaline to yellowish, sometimes with yellowish to brownish intracellular pigmented filamentous hyphae 1–4.5 μm thick. Dehiscence in the upper part as irregular cracks and splits falling away, exposing the gleba. Gleba whitish and fleshy when young, soon becoming blackish brown to grayish violet and powdery at maturity. Context consists of interwoven, septate, thick-walled filamentous hyphae 5–20.5 μm thick;

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**Figs. 1, 2.** *Veligaster nitidum* (TNS-F-13314). **1** Surface of mature basidiomata. **a** Globose part of basidioma. **b** Basidioma with stipe and white mycelial strands. **2** Sectioned mature basidioma. Bars 10 mm



**Fig. 3.** Scanning electron microscopy (SEM) image of basidiospore of *V. nitidum* (TNS-F-13314). Bar 3  $\mu$ m

walls up to 2.5  $\mu$ m thick. Lactiferous yellowish hyphae 2–2.5  $\mu$ m thick, rarely present in the endoperidium, absent in the exoperidium. Clamp connections absent. Basidia not observed. Basidiospores (7–)8–12  $\mu$ m in diameter (including the spines), globose, thick-walled, echinulate; the spines 0.5–1.5  $\mu$ m long, yellowish brown.

**Habitat:** On the ground, under evergreen broad-leaved forests of warm-temperate, subtropical, or tropical areas.

**Distribution:** Pantropical, new to Japan (Tokyo, Shizuoka, and Okinawa) and Thailand (Chiang Mai).

**Specimens examined:** Japan, Metropolitan Tokyo, Hachijo-machi, Hachijo Is., June 20, 2004, Y. Ando, TNS-F-13315; Shizuoka Pref., Kikugawa-shi, Oishi, November 18, 2006, H. Sato, TNS-F-13316; Okinawa Pref., Nago-shi, Mt. Nago, May 2, 2004, Y. Ando, TNS-F-13314. Thailand,

Chiang Mai Province, Near Pai, June 18, 2006, T. Kasuya, TNS-F-13313.

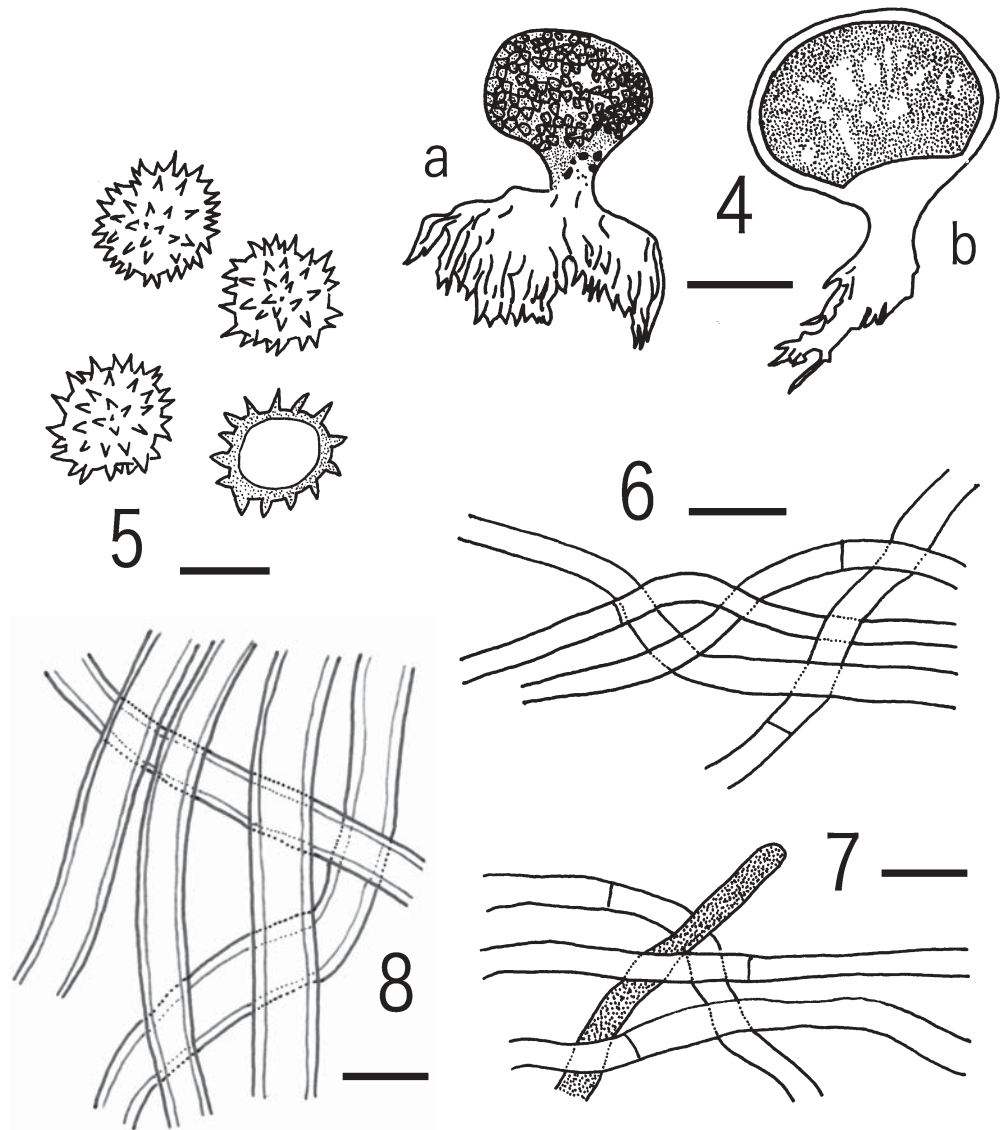
Japanese name: Etsuki-nisesyoro.

Characteristics that separate the genus *Veligaster* from *Scleroderma* Pers. following Guzmán (1969) are mainly the well-stipitate basidiomata and the presence of subgelatinous patches on the upper part of the stipe and the base of the globose part of peridium. *Veligaster* has been put into synonymy with *Scleroderma* by several authors (Demoulin and Dring 1975; Sims et al. 1995). However, these subgelatinous patches are completely absent in *Scleroderma* and in other members of Sclerodermataceae, so this genus is recognized as a good natural taxon (Guzmán and Tapia 1995). Recently, the type species of *Veligaster*, *V. columnaris* (Berk. & Broome) Guzmán, was placed within *Scleroderma* in molecular phylogenetic studies (Binder and Bresinsky 2002; Louzan et al. 2007). This result suggested a close relationship between *Veligaster* and *Scleroderma*. However, further studies are needed for determination of the phylogenetic placement of *Veligaster*, because the other species of this genus have not yet been analyzed by DNA sequences.

Japanese and Thai specimens of *V. nitidum* are macroscopically and microscopically nearly identical with the earlier descriptions of this species (Guzmán and Tapia 1995; Guzmán and Ovrebo 2000; Guzmán et al. 2004) with the exception of peridium morphology. Guzmán and Tapia (1995) described lactiferous hyphae of *V. nitidum* as very common in the peridium. In Japanese and Thai materials, we rarely recognized the lactiferous hyphae in the endoperidium, and those are absent in the exoperidium. However, all other morphological features were identical with those of *V. nitidum*.

*Veligaster nitidum* was often confused with *Scleroderma verrucosum* Pers. However, the latter species differs from the former in lacking subgelatinous patches on the peridium and having larger basidiospores, (10–)11–13(–14)  $\mu$ m in diameter (Guzmán 1967, 1970). *Veligaster pseudostipitatus*

**Figs. 4–8.** *Veligaster nitidum* (TNS-F-13314). **4** Mature basidiomata. **a** Surface of basidiomata: note the scaly peridium, the subgelatinous patches on the stipe, and the well-developed mycelium-like rhizomorphs (also in **b**). **b** Sectioned basidioma. **5** Basidiospores. **6** Hyphae of exoperidium from a subgelatinous patch at the base of the globose part of basidioma. **7** Hyphae of endoperidium. **8** Hyphae of the stipe. Bars 4 10 mm; 5 10  $\mu$ m; 6, 7 4  $\mu$ m; 8 10  $\mu$ m



(Petch) Guzmán & Tapia is morphologically similar to *V. nitidum* by its small scales of the exoperidium at the upper part of the globose part of the basidiomata (Guzmán and Tapia 1995), but it has larger basidiospores, (8.5–)10–13.5(–15)  $\mu$ m in diameter (Guzmán and Tapia 1995; Guzmán et al. 1997). Another four species of this genus, *V. leptopodium* (Har. & Pat.) Guzmán, *V. columnaris*, *V. mexicanus* Guzmán & Tapia, and *V. singaporensis* Guzmán & Tapia, are clearly distinguished from *V. nitidum* by the following features: *V. leptopodium* has a densely scaly exoperidium with pyramidal, deciduous scales at the globose part of the basidiomata (Guzmán 1969; Guzmán and Tapia 1995), and *V. columnaris*, *V. mexicanus*, and *V. singaporensis* have a velvety or smooth exoperidium of the globose part of the basidiomata (Guzmán 1969; Guzmán and Tapia 1995). *Chlorogaster dipterocarpi* Læssøe & Jalink, a member of Sclerodermataceae described from a dipterocarp forest in Malaysia, also has a well-developed stipe similar to *Veligaster* but differs in having a pale green circular peristome and

truncate to conical, greenish exoperidium (Læssøe and Jalink 2004).

*Veligaster nitidum*, originally described from Nepal, was also recorded from Costa Rica, Cuba, Mexico (Guzmán and Tapia 1995), Panama (Guzmán and Ovrebo 2000), and the Virgin Islands (Guzmán et al. 2004). *Veligaster* is an ectomycorrhizal genus, and in Mexico it is mainly associated with subtropical species of *Quercus* spp. (Guzmán and Tapia 1995). The Japanese specimens of *V. nitidum* cited above were collected from warm-temperate or subtropical evergreen forests dominated by *Castanopsis* spp., whereas the Thai collection was found in the tropical evergreen forests dominated by Dipterocarpaceae.

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