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Tremella occultifuroidea sp. nov., a new mycoparasite of *Dacrymyces**

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***Tremella occultifuroidea*, a new parasite of dacrymycetaceous fungi is described. It differs from known *Tremella* parasites in dacrymycetaceous hosts by thick-walled dikaryotic conidia, terminally and repeatedly originating from conidiogenous cells, thus resembling those of *T. polyporina* by Koske, *T. obscura* by Christiansen and *Occultifur internus*.**

Key Words——*Dacrymyces*; mycoparasites; *Occultifur*; *Tremella obscura*; *Tremella occultifuroidea*.

Tremella mycophaga Martin var. *obscura* Olive was discovered and described as a parasite of *Dacrymyces* spp. by Olive (1946b), and ranked to species-level by Christiansen (1954). *Tremella penetrans* (Hauerslev) Jülich (Jülich, 1983) was published as a second *Tremella* parasite of dacrymycetaceous hosts. Chen (1998) found only pseudoclamps in an undescribed mycoparasite, *Tremella giraffa* C.-J. Chen, of *Dacrymyces stillatus* Nees: Fr. Such mycoparasitic *Tremella* species lack basidiocarps, but their features are characteristic for *Tremella*, e.g., tremelloid basidia and haustoria, basidiospores budding off yeasts, and dolipores with cupulate parenthesomes.

Materials and Methods

Material of collection number CCJ 1100 collected from Kuanwu Forest between Hsinchu county and Miaoli county in Taiwan was fixed in part in 2% glutaraldehyde for electron microscopy and the remainder specimen was dried. For transmission electron microscopy, fixed material was later post-fixed with 1% osmium tetroxide, washed with distilled water, stained in uranyl acetate solution, dehydrated in an acetone series, and embedded in ERL according to Spurr (1969). Ultrathin sections were mounted on Formvar coated, single-slot copper grids, poststained in lead citrate solution, and examined in a Zeiss EM109 transmission electron microscope. Illustrations were prepared using a Zeiss Lab16 light microscope with phase contrast.

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Description

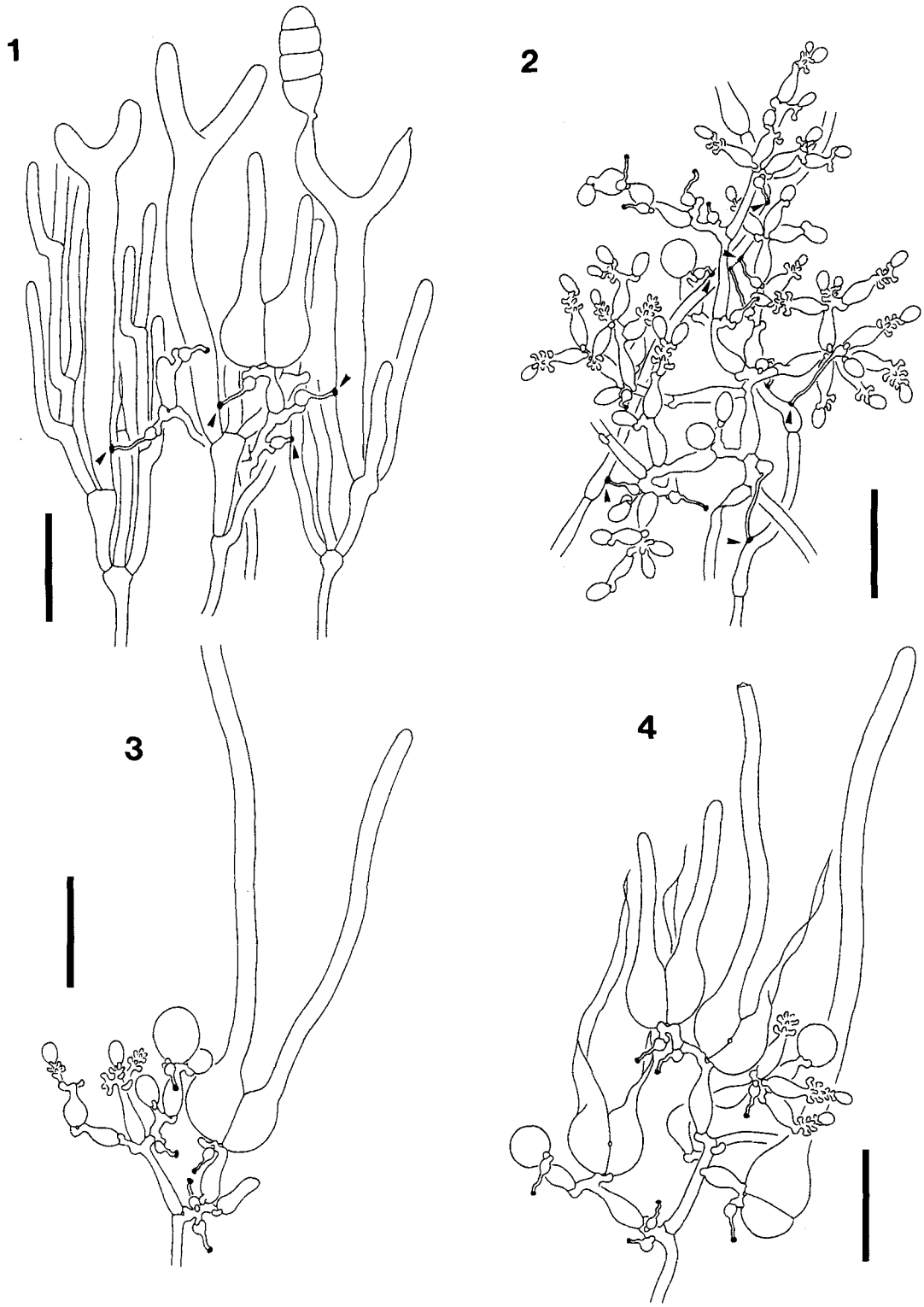
Tremella occultifuroidea C.-J. Chen & Oberwinkler, sp. nov. Figs. 1–20

Fungus fructificatione destitutus, in carposomatibus Dacrymycetum parasiticus. Basidia subglobosa, (9–)11–12(–14)×(11–)13–15(–17) μm, longitudinaliter septata, bicellulares. Sterigmata 3–4.5 μm diam, frequenter usque ad 230 μm longa, parte apicali usque ad 7 μm diam. Basidiosporae subglobosae vel late ellipsoideae, apiculo prominentes, tenuitunicatae, laeves, hyalinae, inamyloideae, (10–)11–13×9–11.5 μm. Cellulae conidiogenae 6–8(–10)×2.5–4(–5.5) μm, basaliter inflatae, apicaliter attenuatae. Conidia subglobosa vel elliptica, (4–)5–7(–8)×3.5–4.5(–5.5) μm, crassitunicata. Hyphae 2.0–2.5 μm diam, hyalinae, tenuitunicatae, geratinosae, fibulatae.

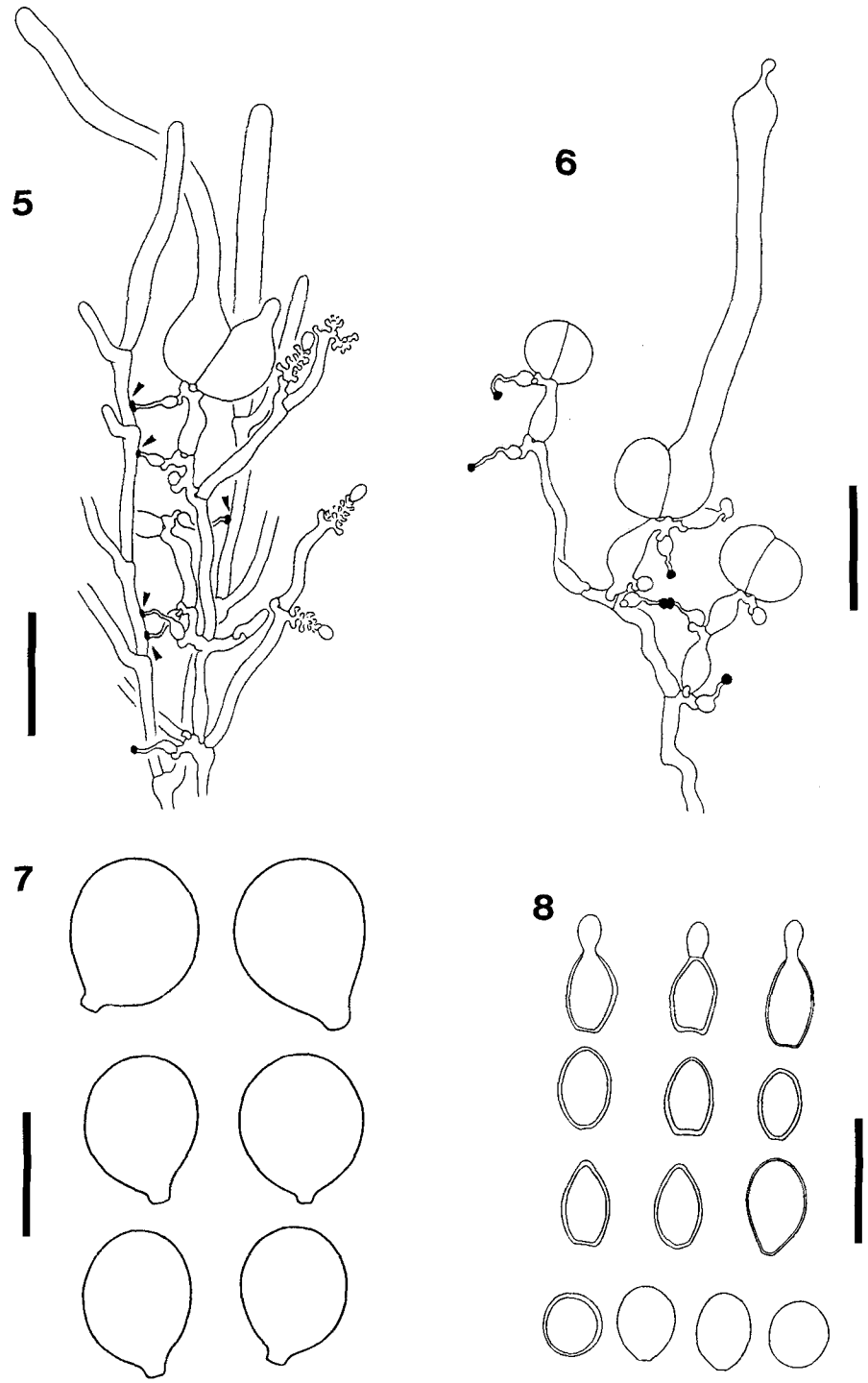
Basidiocarp lacking, the hyphae growing intrahymenia and in the context of dacrymycetaceous basidiomata.

Basidia subglobose, (9–)11–12(–14)×(11–)13–15(–17) μm (Q***=0.71–0.93), broader than long, longitudinally septate, 2-celled, occasionally only one cell producing a sterigma (Figs. 4, 6); sterigmata 3–4.5 μm in diam, apically swollen up to 7 μm in diam (Fig. 6), up to 230 μm long. Spores subglobose to broadly ellipsoid, rarely globose, (10–)11–13×9–11.5 μm (Q=(1.0–)1.10–1.16(–1.25)), each spore with a prominent apiculum (Fig. 7), thin-walled, smooth, hyaline, non-amyloid, germinating by budding. Conidiogenous cells 6–8(–10)×2.5–4(–5.5) μm (Q=(1.35–)1.71–2.29(–2.86)), basally swollen and apically tapering (Figs. 2–4), occasionally the same diam as hyphae (Fig. 5), terminally and repeatedly bearing conidia, each conidium subtended by a clamp (Figs. 2–5, 17); conidiophores and basidia develop-

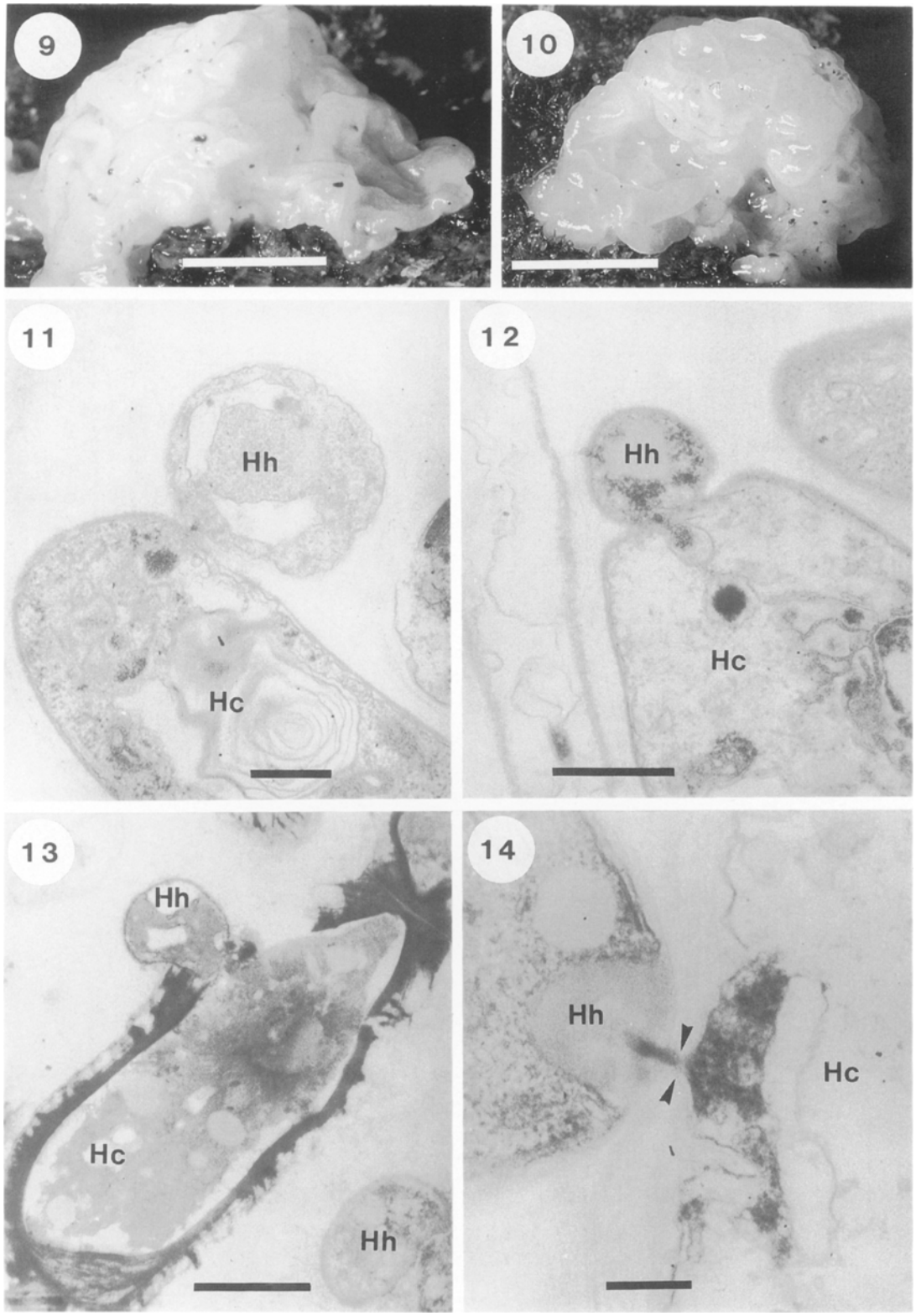
*** Q value=length/breadth ratio (Bas, 1969).



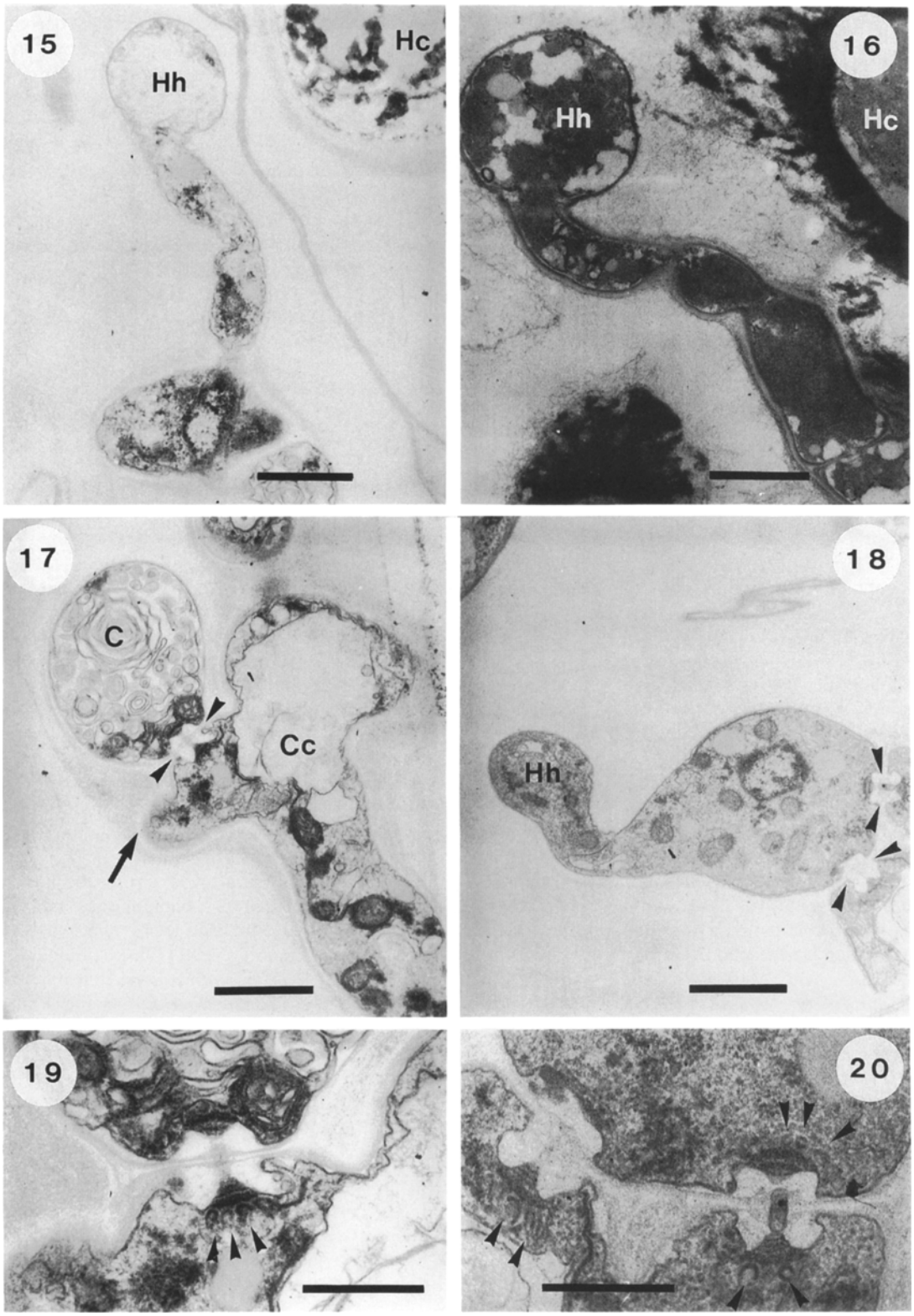
Figs. 1–4. *Tremella occultifuroidea* (C.-J. Chen 1100).
1. Basidial stage of parasite growing in the hymenium of dacrymycetaceous basidiocarp. Note haustorial filaments attached to host structures (arrowheads). 2. Anamorph stage of parasite growing in the inner part of dacrymycetaceous basidiocarp. Note haustorial filaments attached to host structures (arrowheads). 3, 4. Conidiogenous cells and basidia arising from the same generative hypha. Bars = 20 μm.



Figs. 5–8. *Tremella occultifuroidea* (C.-J. Chen 1100).
5. Conidiophores and basidium growing in the hymenium of dacrymycetaceous basidiocarp. Note both arising from the same generative hypha and haustorial filaments attached to host structures (arrowheads). 6. Different developmental stages of basidia arising from one supporting hypha (C.-J. Chen 1208). 7. Basidiospores. 8. Variable conidia, thin- to thick-walled, three of them budding off yeast. 5, 6, bars = 20 μm; 7, 8, bars = 10 μm.



Figs. 9–14. *Tremella occultifuroidea*.
9, 10. Slimy and partly collapsed basidiocarps of dacrymycetaceous host mixed with inconspicuous parasites. 9. Specimen CCJ 1100. 10. Specimen CCJ 1208. 11–14. Haustorial filaments (Hh) penetrating into host cells (Hc) through micropores (arrowheads). 9, 10, bars = 1 cm; 11, 12, bars = 0.5 μm; 13, bar = 2 μm; 14, bar = 0.2 μm.



Figs. 15–20. *Tremella occultifuroidea* CCJ 1100.
15, 16. Haustorial filaments (Hh), apically swollen like candy suckers. 17. Conidium (C) produced from conidiogenous cell (Cc) with a trace of clamp (arrow). Note the dolipores with cupulate parenthesomes (arrowheads). 18. Haustorium and haustorial filaments (Hh). Note dolipores with cupulate parenthesomes (arrowheads). 19, 20. Magnification of dolipores from Figs. 17, 18. Note that arrowheads indicate cupulate parenthesomes. Hc=host cells. 15–18, bars=1 μm; 19, 20, bars=0.5 μm.

ing from the same generative hyphae. Conidia subglobose to ellipsoid, (4–)5–7(–8) × 3.5–4.5(–5.5) μm (Q = 1.00–1.75(–2.0)), slightly to conspicuously thick-walled, gelatinous (Fig. 8). Hyphae 2.0–2.5 μm in diam, occasionally swollen up to 3.5 μm in diam, clamped, hyaline, thin- to slightly thick-walled, gelatinous. Haustoria tremelloid, 2–2.5 μm in diam, frequently originating from clamps, especially from clamps of conidiogenous cells and basidia (Figs. 1–6), haustorial filament apically swollen (Figs. 15, 16, 18), attaching to host cell walls (Figs. 11–13) through micropores (Fig. 14). Dolipores with cupulate parenthesomes (Figs. 17–20).

Host fruit-bodies of *Dacrymyces* sp. ca. 1.0–3.0 cm, rose-white to orange-white (Figs. 9, 10).

Etymology: *occultifuroidea* – similar to *Occultifur internus*, referring to conidiogenous cells.

Type: Taiwan, Kuanwu Forest, between Hsinchu county and Miaoli county, ca. 2,000 m, on the way to waterfall, leg. C.-J. Chen, 16.VI.1995, CCJ 1100, deposited at NTU-TAI-Mycological Herbarium, Department of Botany, National Taiwan University, Taipei, Taiwan. R.O.C. (holotype); Tübingen Herbarium, Lehrstuhl Spezielle Botanik Tübingen University, Germany (isotype).

Other specimen examined: Taiwan, Tashue Shan Forest, Taichung county, ca. 2,200 m, on the mountain pass around guest houses, leg. C.-J. Chen, 13.IV.1996, CCJ 1208.

Habitat: in basidiocarp of *Dacrymyces* sp. growing on decayed wood.

Key for species of *Tremella* parasites in dacrymycetaceous fungi

1. Basidia capitate; hyphae with pseudoclamps ..... *T. giraffa*
1. Basidia subglobose to oval; hyphae with clamps 2
2. Conidia absent; each basidium producing one sterigma ..... *T. penetrans*
2. Conidia present; each basidium usually producing at least two sterigmata 3
3. Conidia dikaryotic, produced repeatedly and terminally from conidiogenous cells, subtended by clamps ..... *T. occultifuroidea*
3. Conidia monokaryotic, budding off from conidiogenous cells ..... *T. mycophage* var. *obscura*

Discussion

Three mycoparasitic *Tremella* species of dacrymycetaceous fungi have been described so far: *T. obscura* on *Dacrymyces deliquescens* (Bull.) Duby (= *D. stillatus*) and on *D. minor* Peck. (Olive, 1946a, b), *T. penetrans* on *D. stillatus* (Hauerslev, 1979; Jülich, 1983), as well as *T. giraffa* on *D. stillatus* (Chen, 1998). *Tremella giraffa* has pseudoclamps which are not observed in other *Tremella* species (Chen, 1998). Christiansen (1954) emended *T. obscura* which is supposedly based upon *T. mycophaga* var. *obscura* (Olive, 1946a). However, Oberwinkler (1990) restudied Christiansen's material and has shown that the description was based upon parts of two different taxa, viz. one with tremelloid basidia and another with the *Occultifur internus* conidiogenous cells. The type material of *T. mycophaga* var. *obscura* was restudied by Bandoni (1987). From reports in the literature (Olive, 1946a; Christiansen, 1954; Bandoni, 1987), *Tremella obscura* differs from *T. occultifuroidea* by the conidial apparatus, measurements of conidia and conidial nuclei. We also checked 14 collections of *Sebacina penetrans* Hauerslev (Hauerslev, 1979; = *T. penetrans* (Hauerslev) Jülich) collected by Hauerslev (Herbarium of Copenhagen, Denmark). Two presented mixtures of *T. penetrans* with *O. internus*. Dikaryotic conidia and basidia of *T. occultifuroidea* always develop on the same generative hyphae, as illustrated in Figs. 3–5.

The conidiogenous cells are swollen and tapered above, terminally and repeatedly bearing conidia, each conidium subtended by a clamp (Figs. 2–5). Such conidiophores were discovered by Olive (1954) in *Platygloea peniophorae* Bourd. & Galz. var. *interna* Olive. Oberwinkler (1990) used these characteristics to propose *Occultifur internus* (Olive) Oberwinkler. *Tremella occultifuroidea* has similar conidiophores and conidiogenous cells, but differs in tremelloid basidia. Terminal conidiogenous cells producing successive clamped conidia have also been reported in *Tremella polyporina* Reid by Koske (Koske, 1972), but it is not clear whether basidia and conidia in Koske material arose from the same hyphae. In addition, the measurements of the basidia, basidiospores, conidiogenous cells and conidia differ from those of *T. occultifuroidea*.

In the same paper, Koske reported basidial development by proliferating basidiogenous cells in *Tremella uliginosa* Karst. (= *Tetragoniomyces ulitinosus* Oberwinkler & Bandoni, 1981) in a manner resembling conidiogeny in *T. occultifuroidea*. In this case, successive basidia are produced and their basal clamps remain on the basidiophores as vestiges, conidial development clearly separates *T. occultifuroidea* from all known *Tremella* parasites of dacrymycetaceous fungi; other characteristics distinguish the species from those parasitzing other hosts.

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