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SHORT COMMUNICATION

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A second species of *Neoheteroceras* and additional characters of the genus

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Abstract A coelomycetous fungus occurring on submerged wood in Japan is described and illustrated as a new species of *Neoheteroceras*. The species is characterized by the large falcate conidia with several tubular appendages, but differs from *N. flageoletii*, the only other known species of the genus, by its larger conidia and longer appendages. The description of the genus *Neoheteroceras* should be emended to allow for this second species, *N. macrosporum*, which differs from the original species by the nature of the disposition of the conidiomata, branched conidiophore, and absence of paraphyses.

Key words Appendages · Coelomycetes · Lignicolous · New species · Taxonomy

The anamorph genus *Neoheteroceras* Nag Raj includes coelomycetes with conidia with tubular appendages. It was originally established by Saccardo (1915) as *Heteroceras* Sacc., based on a *H. flageoletii* found on *Tilia europaea* L. in France. However, the generic name was illegitimate (ICBN Art. 53) because it was a later homonym of *Heteroceras* Forti (1901; Algae). Later, the fungus was renamed *Neoheteroceras* Nag Raj, with the type species, *N. flageoletii* Nag Raj, and was well described and illustrated (Nag Raj 1993). A second record of *N. flageoletii* was reported by Hüseyin et al. (2005) from dead branches of *Tilia rubra* DG. subsp. *caucasica* (Rupr.) V. Engl. in Turkey.

In 2006, we found an anamorphic fungus with the characteristic tubular conidial appendages of *N. flageoletii*, but it differed from the latter by number of septa and dimensions of its conidia. Therefore, in this article we describe this fungus as a new species.

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Neoheteroceras macrosporum H. Yonez. & Kaz. Tanaka, sp. nov. Figs. 1–10

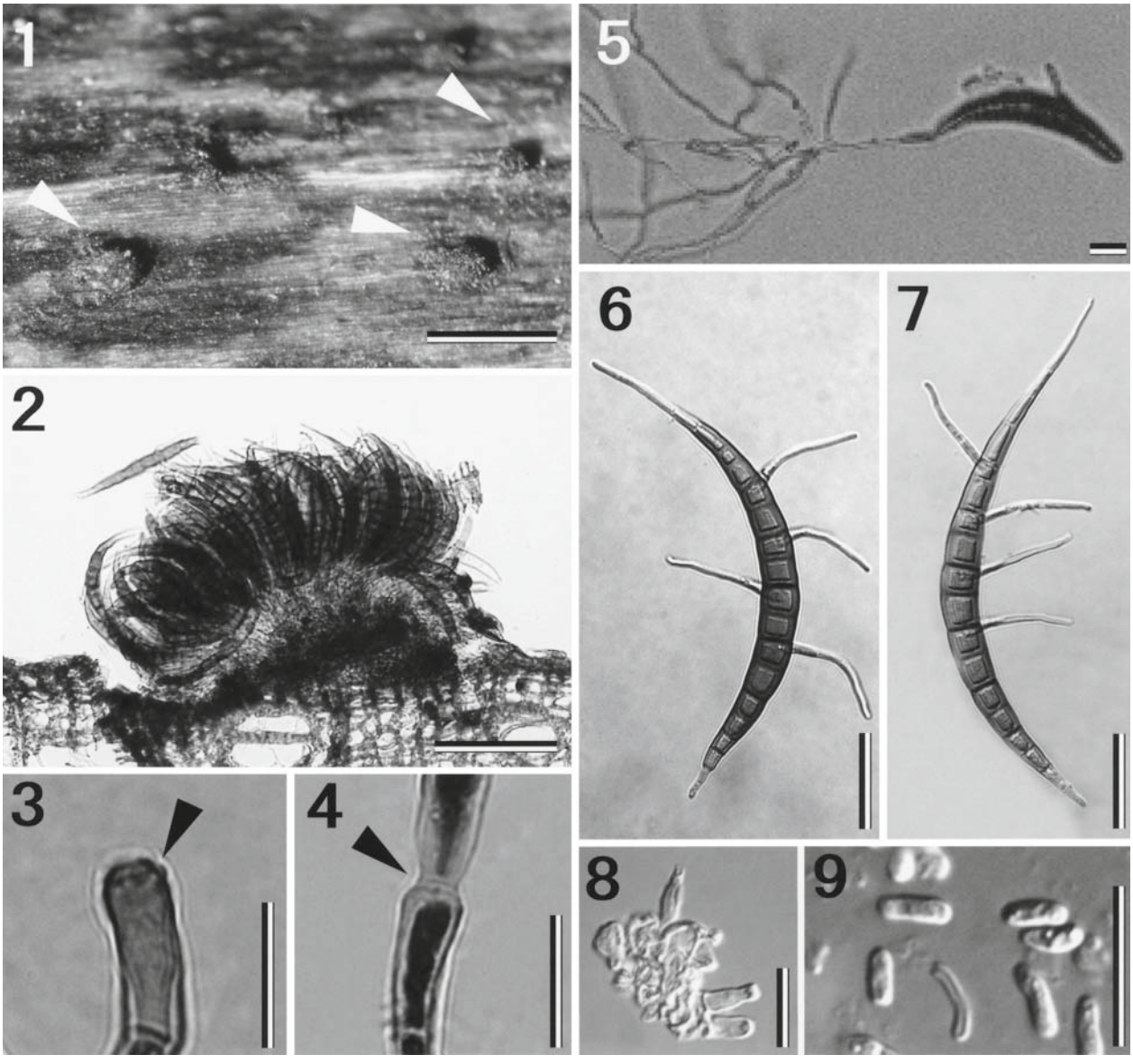
Conidiomata stromatica, superficialia, 100–500 μm lata. Conidiophora ramosa, septata, 15–38 × 3–5 μm. Paraphyses absentes. Cellulae conidiogenae cylindricae, 8–17 × 3–5 μm, 1–3-annellidibus formantes. Conidia falcata, lateraliter appendiculata, 13–15-distoseptata, 110–150 × 10–12.5 μm; cellula basilaris appendicoides, 7.5–15 μm longa, basi 2.5–4 μm lata; cellulae mediis pallide brunneae, 85–107.5 μm longae; cellula apicalis 15–32.5 μm longa, basi 3–4 μm lata. Appendices cellulosae et tubulosae, continuae, hyalinae, rectae vel sinuosae, 20–37.5 × 2.5–3 μm.

Conidiomata stromatic, superficial, dark brown to black, 100–500 μm ($\bar{x}$ = 215 μm, n = 50) wide. Conidiophores cylindrical, branched, septate, constricted at the septa, hyaline, 15–38 × 3–5 μm ($\bar{x}$ = 26.4 × 3.6 μm, n = 50). Paraphyses absent. Conidiogenous cells cylindrical to subcylindrical, hyaline, 8–17 × 3–5 μm ($\bar{x}$ = 11.5 × 4.1 μm, n = 50), with up to three inconspicuous annellations. Conidia falcate, 13–15-distoseptate, constricted at the septa, 110–150 × 10–12.5 μm ($\bar{x}$ = 127.5 × 11.0 μm, n = 50) including the apical and basal appendages, with 0–4 lateral appendages; basal cell obconic with a truncate base, attenuated at the tip, hyaline, 7.5–15 μm long, 2.5–4 μm wide at the base; median cells pale brown, 85–107.5 μm long, thick-walled, smooth; apical cell conical, attenuated at the apex as an unbranched, tubular appendage, 15–32.5 μm long, 3–4 μm wide at the base. Lateral appendages arising from median cells, cellular and tubular, unbranched, hyaline, straight or sinuate, 20–37.5 × 2.5–3 μm ($\bar{x}$ = 30.5 × 2.7 μm, n = 50).

Teleomorph: unknown.

Etymology: from Latin *macro* and *spora*, referring to conidial size of this fungus.

Holotype: on submerged wood; Japan, Ogamizawa, Zatouishi, Hirosaki-city, Aomori Prefecture, July 8, 2006, K. Tanaka, H. Yonezawa, Y. Hiro, and G. Satou (HHUF 29691), deposited in the Herbarium of the Faculty of Agriculture and Life Science, Hirosaki University; Isotype (TNS-F-12765); Ex-type culture, a single conidium culture isolated from holotype (JCM 14566).



Figs. 1–9. *Neoheteroceras macrosporum* (**1–7**, from holotype; **8**, **9**, from JCM 14566). **1** Stromata on natural substratum (*arrowheads*). **2** Stroma in longitudinal section. **3, 4** Conidiogenous cells with annellation (*arrowheads*). **5** Germinating conidium on water agar. **6, 7** Conidia bearing lateral appendages. **8** Conidiogenous cells of a microconidial state. **9** Microconidia. *Bars* **1** 500 µm; **2** 100 µm; **3, 4, 8, 9** 10 µm; **5** 20 µm; **6, 7** 30 µm

Cultural characters: Conidia germinated from apical and basal cells. Colonies on potato sucrose agar (200 g potato; 20 g sucrose; 20 g agar; 1000 ml distilled water) were white and grew 17–19 mm after 27 days. This fungus produced conidia and microconidia (might be spermatial state) on the culture medium. Conidia formed abundantly on stromata and were slightly longer than those on natural substrate (152–227 µm vs. 110–150 µm). Conidiogenous cells of a microconidial state are cylindrical, hyaline, 6–9 × 2–4 µm. Microconidia cylindrical to subcylindrical, hyaline, 4–7 × 1–2 µm.

Notes: The monotypic genus *Neoheteroceras*, based on *N. flageoletii*, is characterized by the tubular lateral appendages of its conidia. We classified our fungus as a species of *Neoheteroceras* because of its similar conidial appendages. However, some morphological features were not consistent with the generic concept of *Neoheteroceras* (Nag Raj 1993). For example, our fungus has superficial stromata, branched conidiophores, and lacks paraphyses. In contrast, these structures of *N. flageoletii* have been reported as subepidermal conidiomata, simple conidiophore, and with filamentous paraphyses (Nag Raj 1993). We did not consider these differences significant enough to warrant classification of the fungi in different genera, because morphology of conidiomata can be affected by environmental conditions (Nag Raj 1981; Watanabe et al. 1998a,b). Moreover, species with

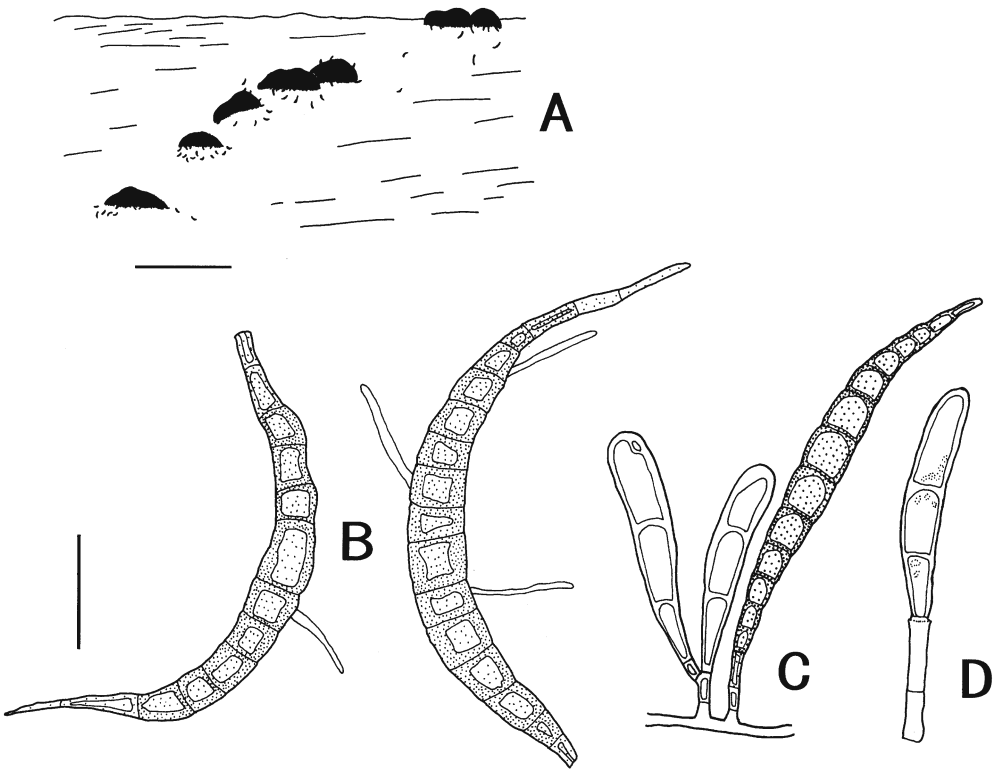


Fig. 10. *Neoheteroceras macrosporum* (holotype). **A** Stromata with dispersed conidia. **B** Conidia bearing lateral appendages. **C** Conidiogenous cells with immature conidia. **D** Conidiogenous cell with annellations. *Bars* **A** 500 μm; **B, C, D** 25 μm

or without branched conidiophores and paraphyses are sometimes included in the same genus (e.g., *Seiridium* Nees: Fr., *Seimatosporium* Corda; Nag Raj 1981). Therefore, the description of *Neoheteroceras* should be emended to allow for this variation.

Neoheteroceras macrosporum clearly differs from *N. flageoletii* by its larger conidia (110–150 × 10–12.5 μm vs. 48–60 × 7–11 μm), the number of septa in its conidia (13–15 vs. 6–7), and its longer appendages (20–37.5 μm vs. 12–30 μm). In addition to these morphological differences, the new species is lignicolous, whereas *N. flageoletii* is fungicolous (Nag Raj 1977, 1993).

Species of the genus of *Neoheteroceras* appear to be rare, because they have been reported only twice (Saccardo 1915; Hüseyin et al. 2005). Therefore, cultural characters and ecological knowledge of the genus are poorly known. The conidia in this genus have characteristic appendages that look like germ tubes. However, germination occurs from the ends of the conidia. The function of these appendages is unknown.

The phylogenetic position of *Neoheteroceras* is also unknown, because no teleomorphs are known. Further collections, cultural studies, and molecular data based on the type species are required to confirm the validity of generic placement of the new species.

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