

## A new species of Laboulbeniales (Ascomycetes) on *Diplocheila* (Coleoptera, Carabidae) from Japan

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A new species of the genus *Laboulbenia*, *L. diplocheilae*, has been established for specimens on the host genus *Diplocheila* (Coleoptera, Carabidae, Licinini). *Laboulbenia diplocheilae* is easily distinguished from *L. proliferans* var. *divaricata* on *Chlaenius* by the absence of a black constriction on the outermost branch of the outer appendage and by the simple stalks subtending grouped antheridia borne on appendage branches in the middle of the appendage system.

Key Words—Carabidae; *Diplocheila*; Japan; *Laboulbenia diplocheilae*; new species.

When Thaxter (1893) described *Laboulbenia proliferans* Thaxter from *Chlaenius* and *Craspedophorus* (as *Eudemata*), he noted the color as amber brown, more or less tinged with olive. The most distinctive character was the proliferation of cell V to form an appendage extending between the black insertion cell and the perithecium. No type specimen was designated. Hosts were from Africa, Asia Minor, and Japan. Thaxter (1896) suggested that the doubtfully determined Japanese host was *Chlaenius*. An illustration of a specimen on *Craspedophorus* (Thaxter, 1896. Pl. 17, Fig. 8) showed no blackening at septa on the appendages, whereas a specimen on *Chlaenius* (Thaxter, 1896. Pl. 17, Fig. 9) had a black septum.

In later years, Thaxter described five varieties of *L. proliferans* distinct from the typical variety: var. *liberiana* Thaxter (1896), var. *atrata* Thaxter (1902), var. *cincta* Thaxter (1902), var. *divaricata* Thaxter (1902), and var. *interposita* Thaxter (1908). He did not regard specimens on *Chlaenius* from Japan as any of the above varieties, whereas specimens on *Diplocheila* were regarded as var. *divaricata* (Thaxter, 1902, 1908). In his studies of Japanese Laboulbeniales, Sugiyama (1973) regarded his specimens on *Chlaenius* as the typical variety and he followed Thaxter in treating the fungus on *Diplocheila zeelandica* (Redtenbacher) as var. *divaricata*. Terada (1996) listed ten species of Japanese chlaeniine carabids on which he obtained many specimens of *L. proliferans* and compared the fungi with one another. However, he did not find any known varieties but the typical variety.

*Laboulbenia proliferans* var. *divaricata* was separated on the basis of the abundantly branched appendage (Thaxter, 1902), in which the branches commonly have blackened bases. The type, on *Chlaenius* from Borneo, was illustrated by Thaxter (1908. Pl. 53, Fig. 6), whereas another cited specimen on *Diplocheila laevis* Lesne (as *Rhombus*) from Java was shown in Pl. 53, Fig. 7. These illustrations indicate the following differences: Fig. 6

shows a smaller specimen with a branched antheridial stalk arising from the basal cell of the inner appendage and darkened septa at the base of the outermost appendage branch and two adjacent branches, whereas Fig. 7 shows a larger specimen with antheridia arising in the middle portion of the appendages, without darkening on the outermost branch.

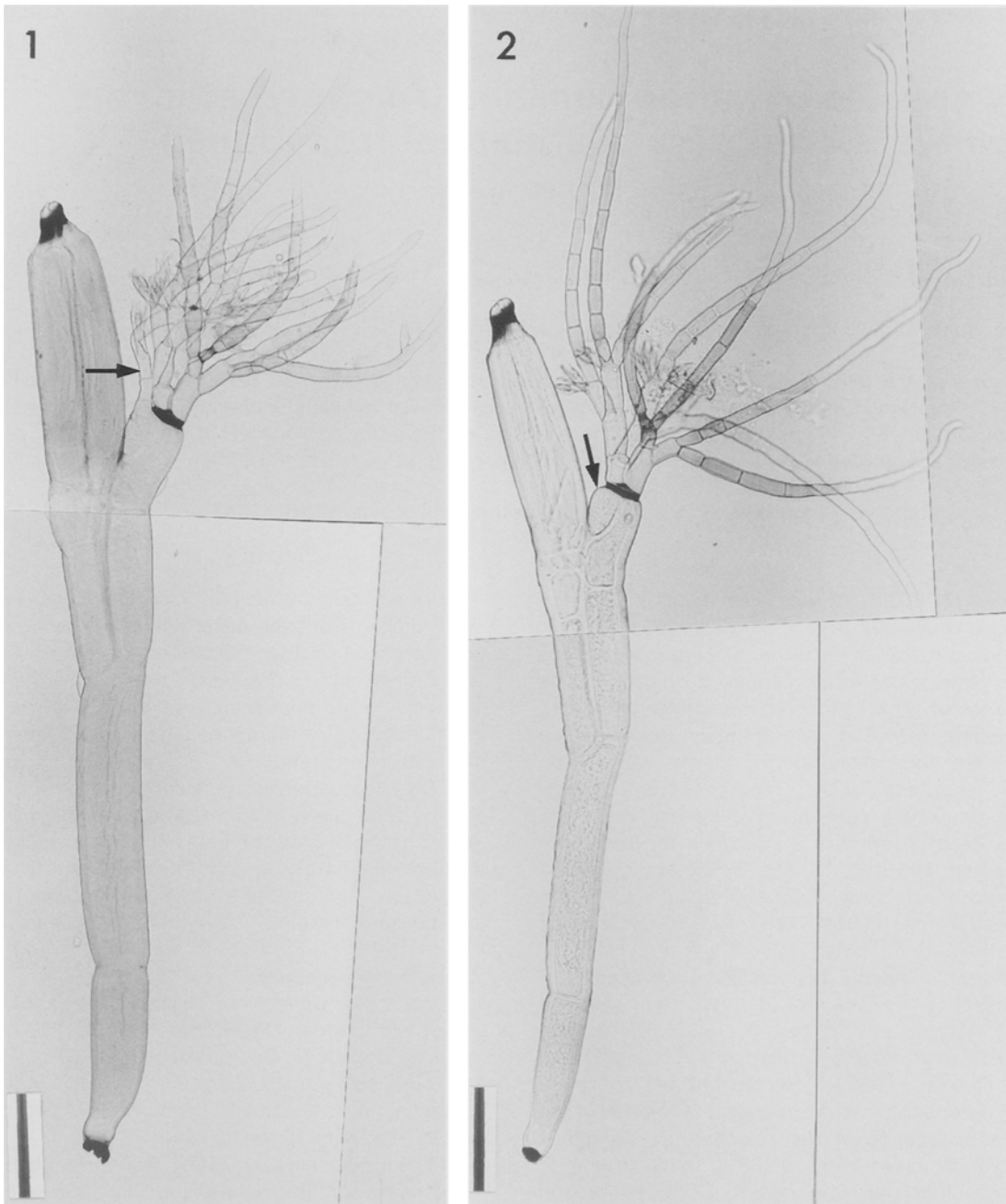
My observations on material collected on *D. zeelandica* and *Diplocheila macromandibularis* and a comparison of the material with the published descriptions and illustrations indicate that the specimens on *Diplocheila* should be regarded as a separate species, *Laboulbenia diplocheilae* Terada.

***Laboulbenia diplocheilae* Terada, sp. nov.** Figs. 1–7  
*Laboulbenia proliferans* Thaxter var. *divaricata* Thaxter, Proc. Amer. Acad. Arts Sci. **38**: 53. 1902. pro parte; Sugiyama, Ginkgoana **2**: 61. 1973.  
*Laboulbenia divaricata* (Thaxter) K. Sugiyama, in Sugiyama et Shazawa, Trans. Mycol. Soc. Japan **18**: 276. 1977. pro parte.

Thallus succineus, 750–1,050  $\mu\text{m}$  longus. Receptaculum elongatum; cellula I subcylindrica, apice attenuata; cellula II cylindrica, cellula I ca. 2-plo longior; cellula III cylindrica, longitudine cellulam I subaequans; cellula IV quam cellula III brevior; cellula V subtriangularis, appendicem secundariam nonnunquam formans. Cellula insertionis libra, prope basin perithecii locata. Appendix exterior 2-3-plo dichotome ramosa, 300–425  $\mu\text{m}$  longa, prope basin constrictione nigricanti. Appendix interior 2-3-plo dichotome ramosa, antheridiis persistenti fasciculatis, ex pedicellis unicellularibus orientibus. Perithecium cylindricum, 230–290  $\times$  60–95  $\mu\text{m}$ , apice projectum, cellula VI longitudine cellulam III aequanti. Ascospores hyalinae, 1-septatae, fusiformes, 70–77  $\times$  5–7  $\mu\text{m}$ .

Holotypus: Tobishima, Yamagata, Terada No. 1361 (K. Terada Herbarium).

Thallus 750–1,050  $\mu\text{m}$  long from foot to tip of peri-

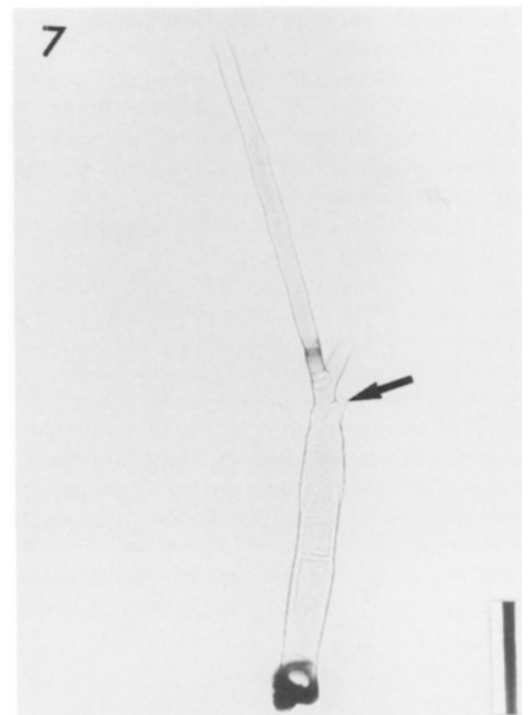
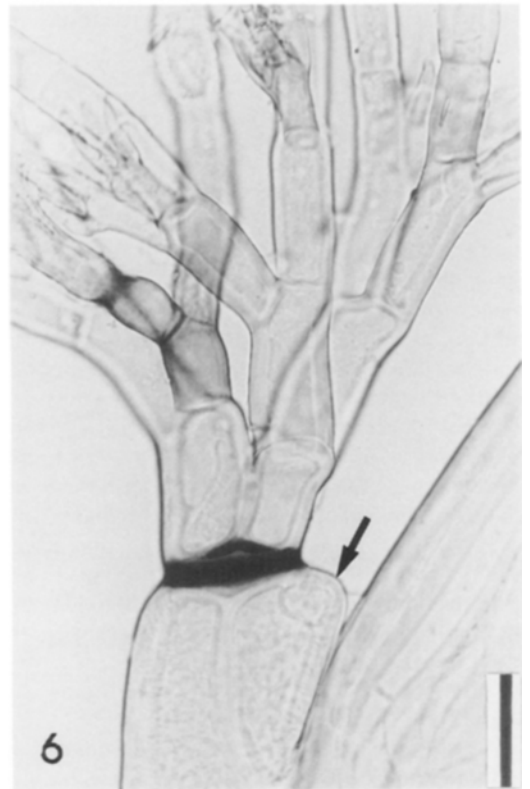
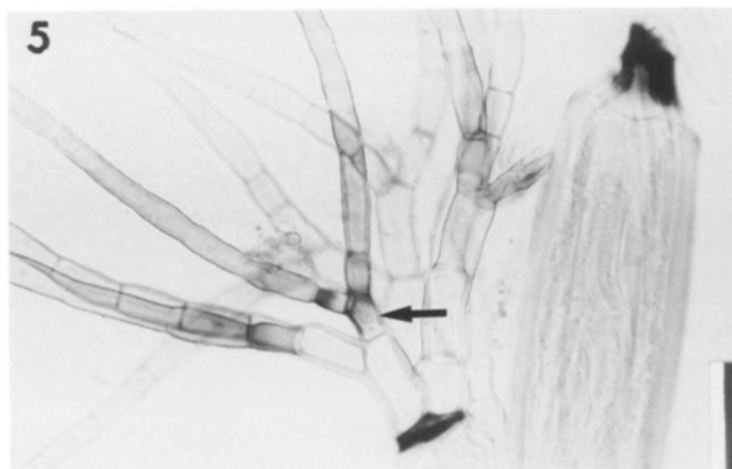
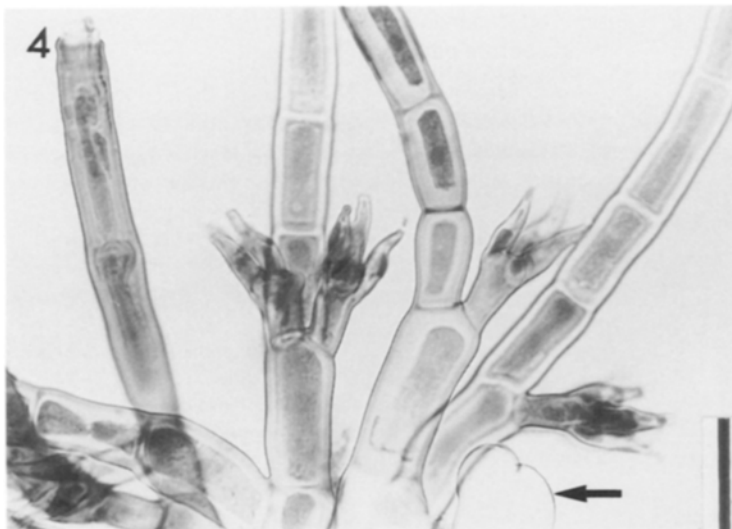
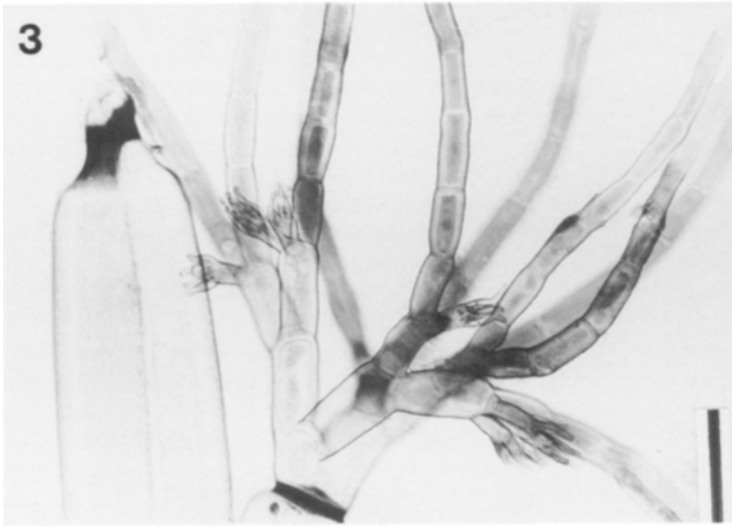


Figs. 1, 2. *Laboulbenia diplocheilae*.

1. Mature thallus showing proliferous cell V from which secondary appendage (arrow) is formed. Upper portion of appendages is damaged. On *Diplocheila macromandibularis*, KT-1364. Bar=100  $\mu\text{m}$ . 2. Mature thallus. Cell V (arrow) is not proliferous yet. Appendages are more or less twisted at each apex. On *Diplocheila zeelandica*, KT-1361. Bar=100  $\mu\text{m}$ .

Figs. 3-7. *Laboulbenia diplocheilae*.

3. Upper portion of thallus showing perithecium with black band below hyaline ostiole, and divaricate appendages. Stained by acetocarmine. KT-1361. Bar=50  $\mu\text{m}$ . 4. Middle portion of appendages showing clustered antheridia with 1-celled stalk. Arrow indicates perithecial apex. Stained by acetocarmine. KT-1361. Bar=25  $\mu\text{m}$ . 5. Upper portion of thallus showing black constriction on inner branch whose basal cell (arrow) is always smaller than basal cell of outer branch. KT-1361. Bar=50  $\mu\text{m}$ . 6. Upper portion of thallus showing cell V (arrow) which begins proliferation. Black constriction is present only on inner branch of outer appendage. KT-1364. Bar=25  $\mu\text{m}$ . 7. Very young thallus with developing appendages. Black constriction is already formed. Arrow indicates initial of inner appendage. KT-1361. Bar=50  $\mu\text{m}$ .



thecium. Receptacle and perithecium becoming amber-colored (yellowish brown with a reddish tinge) with age. Appendages yellowish, often with a blackish tinge above the middle portion. Foot and insertion cell black. Receptacle cell I subcylindrical, narrowed at the base; cell II cylindrical, ca. 2 times longer than cell I; cell III cylindrical, as long as cell I; cell IV shorter than cell III; cell V subtriangular, sometimes forming secondary appendage. Insertion cell located near the base of perithecium and free from the perithecium. Outer appendage 300–425  $\mu\text{m}$  long, branched dichotomously two or more times; basal cell short cylindrical, ca. 2 times longer than wide, with inner and outer branches; basal cell of inner branch smaller than basal cell of outer branch, with black constriction; outer branch with larger basal cell. Inner appendage consisting of right and left axes; each axis branched dichotomously two or more times, with basal cell shorter than basal cell of outer appendage, the middle portion of the inner appendage with 1-celled stalks subtending grouped antheridia. Antheridia persistent, clustered on each stalk. Perithecium cylindrical, 230–290  $\times$  60–95  $\mu\text{m}$ , projecting at the apex, hyaline around the ostiole, blackened below the hyaline apex, with stalk cell (cell VI) equalling cell III in length. Cell VI and cell III adjoining one another. Ascospores hyaline, 1-septate, fusiform, 70–77  $\times$  5–7  $\mu\text{m}$ .

**Eymology:** After the host generic name, *Diplocheila* (Coleoptera, Carabidae, Licinini).

**Specimens examined:** On *Diplocheila zeelandica* (Redtenbacher). KT-1361 (Holotype), 31-VIII-1997, Y. Kurosa leg., Tobishima, Yamagata Pref.; KT-1390, 22-VIII-1993, M. Shiraishi leg., Uoshima, Ehime Pref.; KT-1389, 13-IX-1992, Y. Kusui leg., Nagasaki, Nagasaki Pref. On *Diplocheila macromandibularis* (Habu et Tanaka). KT-1364, 31-VIII-1997, Y. Kurosa leg., Tobishima, Yamagata Pref. The abundant specimens on *D. macromandibularis* had the same color and morphology as those on *D. zeelandica*.

Although Thaxter (1902, 1908) regarded the fungus on *D. zeelandica* from Japan as *L. proliferans* var. *divaricata*, I regard it as a distinct new species, *L. diplocheilae*. This species is easily distinguished from *L. proliferans* var. *divaricata* on *Chlaenius* by the absence of a black constriction on the outermost branch of the outer appendage and by the simple stalks subtending grouped antheridia borne on appendage branches in the middle of the appendage system. In thalli of *L. proliferans*, branched antheridial stalks arise from the basal cell of the inner appendage (Terada, 1996). Based on these characters, the fungus on *D. laevis* shown by Thaxter (1902) appears to belong to the present new species. Therefore, I propose that the host genus *Diplocheila* listed

by Thaxter (1902, 1908, as *Rhembus*, *Bembus*) be excluded from his host list of *L. proliferans* var. *divaricata*.

Sugiyama and Shazawa (1977) elevated *L. proliferans* var. *divaricata* to species level, but their decision was based in part on the greater length of specimens on *D. zeelandica*, whereas the type specimen of *L. proliferans* var. *divaricata* is much shorter (see Thaxter, 1908).

The thallus color of *L. diplocheilae* is somewhat similar to that of *L. proliferans* on *Chlaenius*, but the former species is more reddish and lacks an olive tinge in the perithecia. *Laboulbenia diplocheilae* is large, frequently more than 1 mm in length, but *L. proliferans* on chlaeniine carabids in Japan is also known to have thalli exceeding 1 mm (Terada, 1996).

In young thalli of *L. diplocheilae*, cell V is always undivided, and proliferation of cell V is only occasional even in mature thalli (see also Sugiyama and Shazawa, 1977). Such an occasional proliferation of cell V was also observed in *Laboulbenia pseudomasei* Thaxter (Majewski, 1994; Rossi and Weir, 1997). On the other hand, my observations indicate that cell V of *L. proliferans* on Japanese chlaeniine carabids always begins to divide before perithecial maturation.

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