

BIONECTRIACEAE Samuels & Rossman, *fam. nov.*

Type: *Bionectria* Speg., Bol. Acad. Nac. Ci. 23: 563. 1919.

[= *Seliniaceae* Arx & E. Müll., Acta Bot. Neerl. 4: 121. 1955, nom. inval., Art. 36.1]

Ascomata perithecialia, raro cleistothecialia, candida, flava, aurantiaca, spadicea vel fusca, nec KOH nec acido lactico mutantia, centrum typi *Nectriae*.

Ascomata perithecial, rarely cleistothecial, white, yellow, orange to tan or brown, not changing color in KOH or lactic acid, centrum of *Nectria*-type.

The *Bionectriaceae* are characterized by having uniloculate perithecial, rarely cleistothecial, ascomata that are

pallid, ranging in color from white, yellow, orange to tan or brown, do not change color in KOH or lactic acid, and are generally superficial, lacking a stroma, or are immersed in the substratum. The *Bionectriaceae* include 26 genera. Five of the six cleistothecial hypocrealean genera, namely *Battarrina*, *Emericellopsis*, *Heleococcum*, *Mycoarachis*, and *Roumegueriella*, are placed in the *Bionectriaceae*. These cleistothecial genera lack the centrum characteristics that place them definitively in the *Hypocreales* but the ascomatal wall structure and anamorph suggest the *Bionectriaceae*. Except for *Battarrina* which is as yet unstudied, molecular studies have confirmed the affinities of these genera with the *Bionectriaceae* (Rehner & Samuels, 1994, 1995; Ogawa *et al.*, 1997; Spatafora & Blackwell, 1993).

KEY TO THE GENERA OF THE *BIONECTRIACEAE*

1. Ascomata cleistothecial, globose, without an organized hymenium; asci generally globose, clavate in *Heleococcum* 2
1. Ascomata perithecial, subglobose to pyriform, with organized hymenium; asci elongate 6
- 2 (1). Ascomata dark olive-green to black or hyaline, but appearing brownish due to pale brown ascospores 3
2. Ascomata hyaline to pale gray, bright yellow or reddish brown 4
- 3 (2). Ascospores broadly ellipsoid, 1-septate, smooth-walled **Mycoarachis**
3. Ascospores ellipsoid, non-septate, ornamented with elongate wings . **Emericellopsis**
- 4 (2). Ascospores ellipsoid, 1-septate, smooth to ornamented with wings; anamorph *Acremonium*-like or unknown **Heleococcum**
4. Ascospores globose, non-septate, ornamented with sharp, pointed spines 5
- 5 (4). Ascomata on sporocarps of *Tuber*; ascospores 4-6 μm diam, with sparse echinulations; anamorph unknown **Battarrina**
5. Ascomata on dung, compost, damp paper and various kinds of organic detritus; ascospores more than 6 μm diam, densely echinulate; anamorph, where known, *Gliocladium*-like **Roumegueriella**
- 6 (1). Ascomata immersed in the substratum or in a stroma that may itself be immersed in the substratum 7
6. Ascomata superficial or immersed in a hyphal subiculum or thin stroma 13
- 7 (6). Ascomata immersed in a stroma that may itself be immersed in the substratum; ascospores non- to one-septate; on dung, corticolous, or herbicolous, not lichenicolous or fungicolous 8
7. Ascomata immersed in substratum, non-stromatic, usually solitary; ascospores non- to multiseptate or muriform; corticolous, herbicolous, fungicolous or lichenicolous, not on dung 10

- 8 (7). Ascospores non-septate, more than 40 μm long, hyaline, smooth, thick-walled; on dung **Selinia**
8. Ascospores 1-septate, less than 20 μm long; herbicolous or corticolous 9
- 9 (8). Ascomata in a stroma immersed in bambusoid grasses or in living or dead wood; ascospores hyaline or yellow-brown, coarsely striate with age **Valsonectria**
9. Ascomata immersed in a well-developed, tuberculate to very large stroma, over 5 cm diam, surrounding living stems of bamboo-like grass; ascospores hyaline, smooth to finely spinulose **Mycocitrus**
- 10 (7). On algae or wood in marine habitats; ascomata without or each with a long neck 11
10. Terrestrial or in freshwater habitats; ascomata without a long neck 12
- 11 (10). Ascomata each with a long neck, immersed in algae or wood in marine habitats; ascospores long-fusiform, non-septate, smooth-walled **Halonectria**
11. Ascomata without neck or papilla, erumpent on woody substrata in marine habitats; ascospores ellipsoid, 1-septate, smooth-walled or longitudinally striate ... **Kallichroma**
- 12 (10). Ascomata immersed in herbaceous tissue, bark or wood, rarely fungicolous; anamorphs *Acremonium* or *Kutilakesa* **Nectriella**
12. Ascomata immersed in thalli of terrestrial lichens, rarely on algae or fungi; anamorphs, where known, *Acremonium* **Pronectria**
- 13 (6). Ascospores with long, attenuated ends; on lichens or algae **Paranectria**
13. Ascospores with rounded ends; on lichens, algae or other substrata 14
- 14 (13). Ascomata with straight, solitary hairs; ascospores 1- to multiseptate **Trichonectria**
14. Ascomata without hairs or, if present, hairs fasciculate or flexuous; ascospores generally 1-septate 15
- 15 (14). Ascomata usually superficial on a thin subiculum; anamorph *Gliocladium*; on *Aphyllophorales* **Sphaerostilbella** (*Hypocreaceae*)
15. Ascomata superficial on substratum or immersed in a stroma; if superficial on a thin to cottony subiculum, then not on *Aphyllophorales* 16
- 16 (15). Ascomata immersed in a stroma or superficial with white to tan or green hyphae covering the ascomatal wall 17
16. Ascomata superficial, seated directly on the substratum and without white to tan hyphae covering the ascomatal wall 19
- 17 (16). Ascomata immersed, loosely united in a thin, pseudoparenchymatous stroma; ascomata less than 160 μm diam, walls less than 10 μm thick; ascospores narrowly cylindrical, smooth-walled **Clibanites**
17. Ascomata immersed in an effused hyphal stroma or superficial with a covering of white to tan or green hyphae; ascomata more than 200 μm diam, walls more than 20 μm thick; ascospores ellipsoid to fusiform, smooth, striate, spinulose or tuberculate 18
- 18 (17). Ascomata immersed in an effused hyphal stroma; ascospores generally striate, less often smooth or tuberculate; anamorphs *Acremonium*-like; usually on monocotyledonous plant debris **Protocreopsis**
18. Ascomata immersed in an effused hyphal stroma or superficial with tan hyphae covering the ascomatal wall; ascospores spinulose or verrucose; anamorphs synnematos (*Stilbella*) or *Acremonium*-like; corticolous, sometimes on other ascomycetes **Stilbocrea**

- 19 (16). Ascomata white to pale yellow, small, generally < 200 μm diam, wall thick, smooth or covered with flexuous hairs; ascospores smooth or spinulose, rarely striate; anamorphs, where known, *Acremonium*-like, *Gliocladium*-like, or *Septofusidium*; fungicolous, on myxomycetes, pyrenomycetes and dematiaceous hyphomycetes, rarely on *Aphyllphorales*, or on liverworts and mosses 20
19. Ascomata white to orange, sometimes with white warts, generally > 200 μm diam, wall > 20 μm thick, smooth to conspicuously warted, with or without hyphal to fasciculate hairs; ascospores smooth, spinulose or striate; corticolous, less often fungicolous or herbicolous 22
- 20 (19). Ascomata on liverworts or mosses **Bryonectria**
20. Ascomata on myxomycetes, pyrenomycetes or dematiaceous hyphomycetes, rarely on *Aphyllphorales* 21
- 21 (20). Ascomata on *Asterina*, *Meliola*, *Schnifferula*, growing on superficial, black hyphae covering living leaves **Dimerosporiella**
21. Ascomata on other fungi, including myxomycetes, not on *Meliola* or similar fungi on living leaves **Nectriopsis**
- 22 (19). Ascomata globose to subglobose, occasionally doliiform, becoming cupulate upon drying; ascomatal wall of globose, thin-walled cells; ascospores often striate; anamorphs *Acremonium*-like 23
22. Ascomata globose to subglobose or ovoidal, generally not cupulate upon drying; ascomatal wall of thick-walled cells; ascospores smooth, spinulose or striate; anamorphs *Acremonium*-like, *Clonostachys* or *Didymostilbe* 24
- 23 (22). Ascomata of three regions, with orange oil droplets in the middle region of the wall **Ochronectria**
23. Ascomata of two regions, without orange oil droplets **Hydropisphaera**
- 24 (22). Ascomata with a flattened apex, often with solitary or fasciculate hairs forming an apical fringe; ascospores striate or spinulose; anamorphs *Acremonium*-like or unknown 25
24. Ascomata without distinct hairs, smooth to warted or with short, hyphal hairs; ascospores smooth, spinulose or rarely striate; anamorphs *Clonostachys* or *Didymostilbe* 26
- 25 (24). Ascomata yellow-brown to dark brown, globose to subglobose, with solitary stiff or hyphal hairs, not forming a distinct fringe; ascospores striate or spinulose; anamorphs *Acremonium*; herbicolous or corticolous **Lasionectria**
25. Ascomata white to pale yellow, globose to ovoidal, with a flattened apical disk, often with a fringe of fasciculate hairs; ascospores striate, rarely spinulose; herbicolous **Ijuhya**
- 26 (24). Ascomata white to pale yellow, with large concolorous warts; ascospores hyaline to golden brown, smooth or faintly striate; anamorph *Fusarium* **Albonectria** (*Nectriaceae*)
26. Ascomata white, bright yellow, orange, tan to brown, smooth, scurfy or with large, white warts; ascospores hyaline, spinulose or striate; anamorph *Clonostachys* or *Didymostilbe* 27
- 27 (26). Ascomata bright- to dark yellow, with walls over 50 μm thick; ascospores broadly reniform to broadly fusiform, with rounded ends, more than 30 μm long; anamorph synnematous, *Didymostilbe* **Peethambara**
27. Ascomata white, yellow, tan, to brown, with walls less than 50 μm thick; ascospores ellipsoid to fusiform, less than 30 μm long; anamorph not synnematous, *Clonostachys* **Bionectria**