



A. Habit view of cluster of ascomata emerging from bark (bar = 1 mm). B. Detail of four ascomata; note spines (bar = 0.5 mm). C. Ascomatal wall in vertical section, showing darker outer layer (below, with 'Munk pores') and lighter inner layer (above). D. Upper parts of two asci, showing large number of ascospores in each, arranged in 'herringbone' pattern (bar = 10 μ m). E. Ascospores. [C–E all at same magnification.]

- Nitschkia broomeana** (Berk.) Nannf., *Svensk Botanisk Tidskrift* **69**(1): 60 (1975) [as 'broomeiana'].
Sphaeria broomeana Berk., *Hooker's Journal of Botany* **6**: 231 (1854) [as 'broomeiana'].
Coronophora broomeana (Berk.) Sacc., *Sylloge Fungorum* **1**: 106 (1882) [as 'broomeiana'].
Fracchiaea broomeana (Berk.) Petch, *Annals of the Royal Botanic Garden, Peradeniya* **6**(4): 333 (1917).
Sphaeria rasa Berk., in J.D. HOOKER, *Botany of the Antarctic Voyage of H.M. Discovery Ships Erebus and Terror, in the years 1839–1843* II. *Flora Novae-Zealandia* **2**(Flowerless Plants, Part 8): 205 (1855).
Fracchiaea rasa (Berk.) Sacc., *Sylloge Fungorum* **1**: 95 (1812).
Sphaeria subcongregata Berk. & M.A. Curtis, in H.W. RAVENEL, *Fungi Caroliniani Exsiccati* **4**: no. 57 (1855) [*nom. nud.*].
Fracchiaea subcongregata (Berk. & M.A. Curtis) Ellis & Everh., *North American Pyrenomycetes*: 244 (1892).

- Fracchiaea heterogena* Sacc., *Atti dell'Accademia Scientifica Veneto-Trentino Istriana* **2**(2): 115 (1873) [see also p. 163].
- Echusias vitis* Hazsl., *Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien* **23**: 367 (1873).
- Fracchiaea vitis* (Hazsl.) Höhn., *Annales Mycologici* **17**(2–6): 131 (1920).
- Cucurbitaria brevibarbata* Berk. & M.A. Curtis, in BERKELEY, *Grevillea* **4**(no. 30): 47 (1875).
- Fracchiaea brevibarbata* (Berk. & M.A. Curtis) Sacc., *Sylloge Fungorum* **1**: 94 (1882).
- Sphaeria subconnata* Berk. & M.A. Curtis, in BERKELEY, *Grevillea* **4**(no. 32): 141 (1876) [*nom. illegit.*, ICBN Art. 53.1, non Schwein., 1832].
- Coelosphaeria subconnata* (Berk. & M.A. Curtis) Sacc., *Sylloge Fungorum* **1**: 93 (1882).
- Fracchiaea subconnata* (Berk. & M.A. Curtis) Cooke, *Grevillea* **15**(no. 75): 83 (1887).
- Nitschkia subconnata* (Berk. & M.A. Curtis) O. Kuntze, *Revisio Generum Plantarum* **3**(2): 501 (1898).
- Gibbera moricarpa* Cooke, *Grevillea* **7**(no. 42): 51 (1878).
- Fracchiaea moricarpa* (Cooke) Sacc., *Sylloge Fungorum* **1**: 94 (1882).
- Fracchiaea cucurbitarioides* Speg., *Annales de la Sociedad Cientifica Argentina* **10**(1): 16 (1880).
- Sphaeria subconvexa* Berk. & Ravenel, in M.C. COOKE, *Grevillea* **15**(no. 75): 83 (1887) [*nom. nud.*].
- Fracchiaea americana* Berl., *Fungi Moriccolae* **5**: 1, fig. V, no. 1, tab. 15, figs 1–6 (1888).
- Fracchiaea glomerata* Pat., *Journal de Botanique* **3**(10): 168 (1889).
- Nitschkia paucida* Berk. & M.A. Curtis, in M.C. COOKE, *Grevillea* **20**(no. 96): 107 (1892).
- Fracchiaea eucalyptina* Berl., *Icones Fungorum* **3**: 27, tab. 35, fig. 1 (1900).
- Fracchiaea cucurbitarioides* f. *eucalyptina* (Berl.) Speg., *Anales del Museo Nacional de Historia Natural de Buenos Aires* Ser. 3, **19**(12): 333 (1909).
- Bertiella polyspora* Kirschst., *Abhandlungen des Botanisches Vereins der Provinz Brandenburg* **48**: 51 (1906) [*fide* ERIKSSON & YUE, 1986].
- Kirschsteinia polyspora* (Kirschst.) Syd., *Annales Mycologici* **4**(5): 455 (1906).
- Fracchiaea cucurbitarioides* f. *pini-insignis* Speg., *Anales del Museo Nacional de Historia Natural de Buenos Aires* Ser. 3, **19**(12): 333 (1909).
- Fracchiaea cucurbitarioides* f. *quercus-sessiliflorae* Speg., *Anales del Museo Nacional de Historia Natural de Buenos Aires* Ser. 3, **19**(12): 334 (1909).
- Fracchiaea depressa* Petch, *Annals of the Royal Botanic Garden Peradeniya* **6**(3): 221 (1917) [*fide* NANNFELDT, 1975].

Colonies as single ascomata or clusters of 2–30 ascomata emerging from cracks in bark or other woody material, the bark then frequently becoming detached so that the ascomata appear to be superficial. *Ascomata* ± globose, only rarely collapsing into a cup-shape, 350–650 µm, often ornamented with pointed spines up to 25 µm (the spines themselves being sometimes forked and often with secondary barb-like ornamentation), without an ostiole, but with a short dome-like special opening apparatus (sometimes called a ‘Quellkörper’); outer wall composed of dark- and thick-walled cells forming a well-defined *textura angularis*, individual cells often with small but conspicuous pores which look like minute bullet holes (sometimes called ‘Munk pores’); inner wall composed of paler, thinner-walled, flatter cells also forming a *textura angularis*. *Asci* arising from the base of the ascoma, oblong to obovate, thin-walled, with only one wall layer visible with the light microscope, up to 125 × 25 µm, with a short stalk, containing more than 200 ascospores usually characteristically arranged in a ‘herringbone’ pattern. *Ascospores* colourless, subcylindrical, slightly curved, smooth, 8–11 × 1.5–2 µm, with one droplet in each end, eventually with a faint septum. *Anamorph* not observed. [Description adapted from NANNFELDT (1975).]

DISEASE: None reported.

HOSTS: Plantae: *Acer negundo*, *A. pseudoplatanus* (branch), *Acer* sp.; *Aesculus* sp.; *Ailanthus altissima*; *Alnus* sp.; *Bombax* sp. (bark); *Butea monosperma* (twig); *Buxus* sp.; *Cercis canadensis*; *Cinchona* sp.; *Cocos nucifera*; *Crataegus* sp. (twig); *Delonix regia* (twig); *Dracontomelon sinense*; *Eucalyptus globulus* (bark, branch), *E. lanceolatus* (bark), *E. viminalis*, *Eucalyptus* sp. (bark); *Euphorbia* sp. (stem); *Ficus religiosa* (twig), *Ficus* sp. (canker); *Fraxinus* sp.; *Gleditsia triacanthos*; *Holoptelea integrifolia* (twig); *Ilex* sp.; *Lindera benzoin*; *Liquidambar styraciflua*, *Liquidambar* sp.; *Lonicera* sp.; *Magnolia virginiana*;

Mangifera indica; *Mimusops hexandra* (stem); *Morus rubra*, *Morus* sp.; *Myrica* sp.; *Nyssa sylvatica*; *Oogeinia oogeinensis* (stem); *Persea americana*; *Pinus strobus*, *P. sylvestris* (cone), *P. taeda*, *Pinus* sp.; *Pongamia glabra*; *Prunus* sp.; *Pyrus communis*, *P. malus*; *Quercus* sp.; *Rhamnus* sp.; *Robinia pseudacacia*; *Rubus* sp.; *Salix koreensis*, *S. nigra*; *Sambucus canadensis*; *Sassafras* sp.; *Schizolobium* sp.; *Shorea robusta* (stem, wood); *Sophora japonica*; *Tectona grandis* (root); *Tilia heterophylla* var. *michauxii*; *Ulmus alata*; *Viburnum grandiflorum*, *Viburnum* sp.; *Weinmannia* sp. Other associated organisms: Fungi: *Botryosphaeria ribis*.

GEOGRAPHICAL DISTRIBUTION: AFRICA: Gambia, Ghana, Malawi, Sierra Leone, Zimbabwe. NORTH AMERICA: USA (Alabama, Florida, Georgia, Idaho, Louisiana, Nebraska, New Jersey, North Carolina, Ohio, Oklahoma, South Carolina, Tennessee, Virginia). CENTRAL AMERICA: Guatemala, Nicaragua, Panama. SOUTH AMERICA: Argentina, Brazil, Venezuela. ASIA: China (Beijing, Fujian, Hebei, Hunan, Jiangsu, Sichuan, Yunnan, Zhejiang), India (Andhra Pradesh, Chhattisgarh, Madhya Pradesh, Maharashtra), Japan, Korea, Pakistan, Sri Lanka, Taiwan. AUSTRALASIA: Australia (South Australia), New Zealand. EUROPE: former Czechoslovakia, France, Great Britain, Italy, former Yugoslavia.

INFRASPECIFIC VARIATION: The large number of synonyms, many of which are subspecific in rank, suggests that there may be some infraspecific variation in this fungus. Slightly larger ascospores have been observed, for example, in collections from northwest Scotland, than in collections from lower latitudes.

TRANSMISSION: Ascomata of this species open by irregular apical cracks, but the mode of ascospore release and transmission is not known.

NOTES: *Diagnostic features.* Clusters of ascomata ornamented with short spines emerging from bark or superficial on woody substrata; asci each containing more than 200 ascospores usually arranged in a characteristic 'herringbone' pattern.

NANNFELDT (1975) regarded this species as 'widespread in most warmer countries' but thought that in Europe records 'from more northern areas are erroneous'. While this may be generally true, several specimens have been collected on fallen cones of *Pinus sylvestris* in native woodland in Scotland, but only in the northwest, where the mild climate and infrequent frosts as a result of the Gulf Stream may be a significant factor. There, the fungus is never abundant and only very occasionally encountered, but appears to be native.

Interactions. None reported. Probably saprobic or, like other members of this genus, parasitic on other fungi.

Conservation status. Records exist from at least 1854 to November 2001, and the species has been observed from January–June and August–December. In addition to cited literature and internet sources, this description sheet is based on 19 items in the **IMI** dried reference collection, 18 records in the author's computerized database (11 of which refer to **IMI** items), 4 records in the Fungal Records Database for the British Isles (<http://194.203.77.76/fieldmycology/>), 62 records in the USDA database (<http://nt.ars-grin.gov/fungaldatabases/index.cfm>) and 4 specimens in the **K** fungal reference collection. This fungus is very widely distributed and rather frequently encountered. The absence of recent records may be more a reflexion on the decline of field mycologists than an indication of a change in population status. The species is associated with many different and unrelated plants, many undoubtedly not at risk, although they may not be the nutrient source if *N. broomeana* is indeed parasitic on other fungi. There are no obvious threats. Using IUCN criteria [IUCN SPECIES SURVIVAL COMMISSION (2006). *2006 IUCN Red List of Threatened Species*. <www.iucnredlist.org>. Downloaded on 15 May 2006], the species is assessed globally as least concern.

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[Number in brackets, e.g. (62, 5055), refer to abstracts in *Review of Plant Pathology*]

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