

Freshwater ascomycetes from north Maharashtra-III

S. Y. Patil

P. G. Department of Botany, S.S.V.P.S.L.K.Dr. P. R. Ghogrey Science College, Dhule-424005 (M.S.), India

Abstract

The present paper deals with two species of *Zopfiella* Winter the freshwater ascomycetes viz. *Zopfiella latipes* (Lundq.) Malloch and Cain and *Zopfiella submersa* Guarro, Ai-Saadon, Gene and Abdullah were collected from the submerged wood samples from the various water bodies in North Maharashtra region. *Zopfiella submersa* Guarro, Al-Saadon, Gene and Abdullah is being recorded for the first time from India, while *Zopfiella latipes* (Lundq.) Malloch and Cain is being reported for the first time from North Maharashtra. Brief notes and illustration are given for each taxon. Geographical distribution of each species in India is also provided.

Keywords: Freshwater ascomycetes, North Maharashtra, India

INTRODUCTION

Fungi that are recorded in freshwater habitats can be indwellers or immigrants. "Indwellers" are fully adapted to aquatic environments and can grow and sporulate in water and are often adapted to dispersal in water, while "Immigrants" must continually immigrate from other habitats to maintain their population in water [1]. Wong et al. (1998) [2] points out that there are numerous Ascomycete species that commonly occur in freshwater habitats and have not been found in terrestrial habitats, and only these fungi can be confidently categorized as freshwater Ascomycetes. Vijaykrishna et al. (2005) [3] suggested that due to controversies associated with the definition of this ecologically distinct group, any Ascomycetous fungus that have been isolated from submerged plant substrates be considered as freshwater Ascomycete.

The freshwater Ascomycota is one of the least studied groups of fungi. Although sporadic reports of Ascomycete species that colonize aquatic macrophytes occur in the early Ascomycete systematic literature. Ingold was the first to recognize that a distinctive freshwater ascomycota might exist and published a series of papers about fungi on submerged substrates in the Lake District, England [4, 5, 6 and 7]. Ingold was collecting from the submerged stems of aquatic macrophytes when he discovered *Macrospora scripicola* on *Schoenoplectus laacustris*, the lakeshore bulrush [6]. This fungus is one of the earliest known freshwater Dothideomycetes species. Pringsheim (1858) [8] first reported it from freshwater.

In India freshwater ascomycetes were discovered by Manoharachary and Rama Rao (1972) [9] first discovered new freshwater ascomycetous genus *Subbaromyces* with *Subbaromyces aquaticus* as its type species from South India.

Udaiyan (1989) [10] reported 10 ascomycetous species from water-cooling towers from South India. Out of ten species, 8 species

were first time reported from lotic habitats. Latter on Udaiyan and Hosogaudar (1991) [11] discovered nine taxa from water-cooling tower of Madras. Of these four are new genera namely *Anekabeeja*, *Mukhakesa*, *Neelakesa* and *Phialogangliospora* while *Chaetomium lunasporium*, *Didymosphaeria pittospora*, *Leptosphaeria dimidiata*, *Mycosphaerella aquatica* and *Pleospora subramanianii* are the new species of ascomycetes from freshwater habitats. Recently, Borse and Pawara (2007) [12] reported *Savoryella aquatica* and *S. lignicola* from north Maharashtra region. Recently, Sridhar et al. (2010) [13] recorded some freshwater ascomycetes from Karnataka.

MATERIALS AND METHODS

The survey was undertaken for two years (2008-2010). Monthly random collections of fifty submerged; partially decomposed woody debris (1-5 cm diam. and 30 cm length) were made from the various sites viz. Tapti river, Panzara river, Latipada Dam, Aner Dam. The samples were returned to the laboratory keeping in plastic bags in the field and immediately examined with a dissecting microscope to locate fungal fruiting bodies. After the first observation, samples were incubated for few months on a moist paper towels in sterile plastic boxes at ambient temp. of 25^o -30^o C for three months to stimulate fungal development. Incubated samples were examined on day ten and then over three months under a dissecting microscope for fungal fruiting bodies. The fungal taxa present on the wood samples were recorded, identified and isolated. Voucher slides of the fungi reported were deposited in the mycology herbarium, P. G. Department of Botany, S. S. V. P. Sanstha's L. K. Dr. P. R. Ghogrey Science College, Dhule, M. S.

Taxonomic Account

Genus: *Zopfiella* Winter

Ascomata: solitary or gregarious, globose to subglobose, superficial or rarely immersed, nonostiolate, thin-walled, irregularly dehiscing, covered with hairs. **Peridium:** pseudoparenchymatous, membranaceous, cephalothecoid in some species, cells forming a *textura angularis*. **Paraphyses:** early deliquescent, indistinct or absent. **Asci:** 4 to 8-spored, clavate to cylindrical or rarely subglobose, pedunculate, unitunicate, deliquescent, in some species with an apical ring, fasciculate or irregularly arranged. **Ascospores:**

Received: April 02, 2012; Revised: May 05, 2012; Accepted: June 02, 2012.

*Corresponding Author

S. Y. Patil

P. G. Department of Botany, S.S.V.P.S.L.K.Dr. P. R. Ghogrey Science College, Dhule-424005 (M.S.), India

Tel: +91-9922296057; Fax: +91-2562272562

Email: sambhajiyp@rediffmail.com

uni-, bi-, or triseriate, at first 1-celled, hyaline, becoming 1-septate, hyaline in the lower third, forming a large ellipsoidal, dark upper cell and a small, mostly cylindrical, hyaline, often collapsing basal cell; the upper cell may become divided by a horizontal septum in some species; with an apical or subapical germ pore. The genus is represented by 2 species in marine habitats.

Type species: *Zopfiella tabulata* Winter

Habitat: Saprobic on intertidal and mangrove wood.

Description: Based on Kolhm. & Kolhm. (1979) [14].

Zopfiella latipes (Lundqvist) Malloch & Cain

Ascomata: 120-700 μm in diam., globose to subglobose, superficial or immersed, nonostiolate, coriaceous, irregularly dehiscing, dark brown, covered with hyaline to grayish- or yellowish-brown, septate, branched hairs, 1.5-4 μm in diam.; solitary. **Peridium:** 40-50 μm thick, semitransparent, composed of 3 or 4 layers of irregular or angular, thin-walled cells of 5-12 μm in diam., forming a *textura angularis*. **Paraphyses:** up to 12 μm in diam., composed of vesicular cells, early deliquescent. **Asci:** 80-120 x 12-18 μm , 8-spored, clavate, broadest in the middle, short pedunculate, apically truncate, unitunicate, deliquescent, with a simple apical ring, 2.1 μm wide; fasciculate. **Ascospores:** biserial, ellipsoidal, becoming 1-septate in the lower third; slightly constricted at the septum; larger upper cell 16-22(-25) x 10-13(-15) μm , ellipsoidal, apex conical or abuncate, base truncate, olivaceous to brown, thin-walled, smooth, with a apical germ pore, 1 μm in diam.; smaller lower cell 4-8(-9) μm long, 3.5-7 μm in diam., broadly cylindrical, apex truncate, base broadly rounded, hyaline, at maturity without cytoplasm; the base and one side of the lower cell thin-walled, collapsing, and giving it a cuplike shape; collapsed lower cell appearing triangular in lateral view.

Habitat: Saprobic on submerged wood.

Description: Based on Kolhm. & Kolhm. (1979) [14].

Distribution: West Coast:-Gujarat: On intertidal wood of *Avicennia marina* [15]; Maharashtra: On intertidal wood and submerged wood of *Avicennia alba* and *A. marina* [16 and 17]; Karnataka: On intertidal wood of *Avicennia officinalis*, *Bruguiera gymnorrhiza*, and *Sonneratia caseolaris* [18 and 19]; Pondecherry (Mahe): On intertidal wood [20], Kerala: On intertidal wood [14], on intertidal mangrove wood [21 and 22].

East Coast:-Tamil Nadu: On intertidal wood [23], On mangrove wood [21]; Andhra Pradesh: On intertidal wood [14], on intertidal wood of *Avicennia officinalis* [24, 25, 26, 27, 28 and 29].

Zopfiella submersa Guarro et al. (1997) [30].

Ascomata: superficial and immersed, globose or subglobose, 230-470 μm diam., nonostiolate, with hairs uniformly distributed on the surface; ascoma hairs pale brown, unbranched, thin-walled, scarcely septate, 10-20 x 2.5-3.5 μm . **Peridium:** 10-16 μm thick, membranaceous, pseudoparenchymatous, brown, composed of 8-13 layers of cells of *textura angularis*; cells prismatic, 9-12 μm diam. **Asci:** 8-spored, cylindrical to clavate 90-120 x 14-20 μm , apex rounded and with a small, iodine negative subapical ring, evanescent. **Ascospores:** two celled; upper cell 13.0-20.5 x 10-14 μm , limoniform, truncate at the base, smooth, thick-walled, dark brown, with a conspicuous subapical germ pore, umbonate at the apex; lower cell 6-13 x 3-5 μm , cylindrical with a rounded or slightly tapering end, hyaline to pale brown, occasionally dark brown, more or less thin-walled.

Habitat:- Saprobic on submerged wood.

Description:- Based on Guarro et al. (1997) [30].

Distribution:- Maharashtra (present study)

Remark: It is being recorded for the first time from India. Both species viz. *Zopfiella latipes* (Lundq.) Malloch and Cain and *Zopfiella submersa* Guarro, Ai-Saadon, Gene and Abdullah were found rarely.

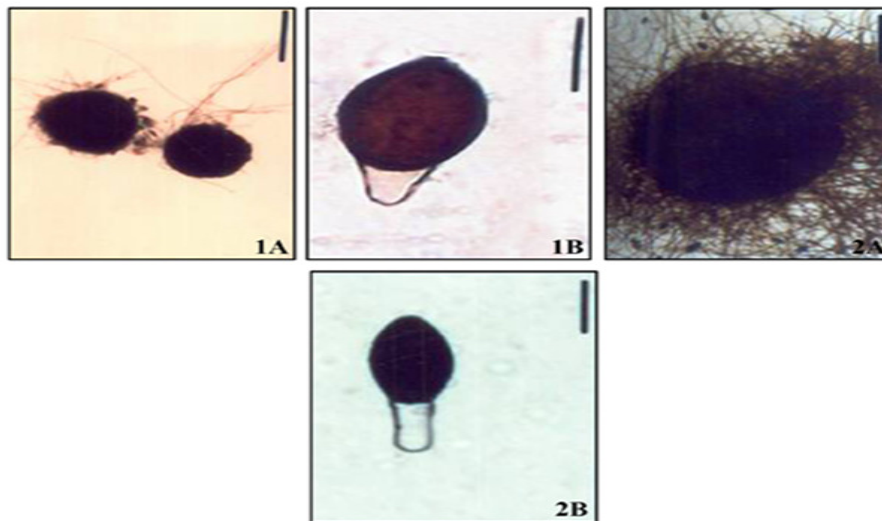


Fig. 1. *Zopfiella latipes*. A) Ascomata (Scale Bar= 75 μm) B). Ascospores (Scale Bar=10 μm)

Fig 2. *Zopfiella submersa* A). Ascomata (Scale Bar= 50 μm) B). Ascospores (Scale Bar=10 μm)

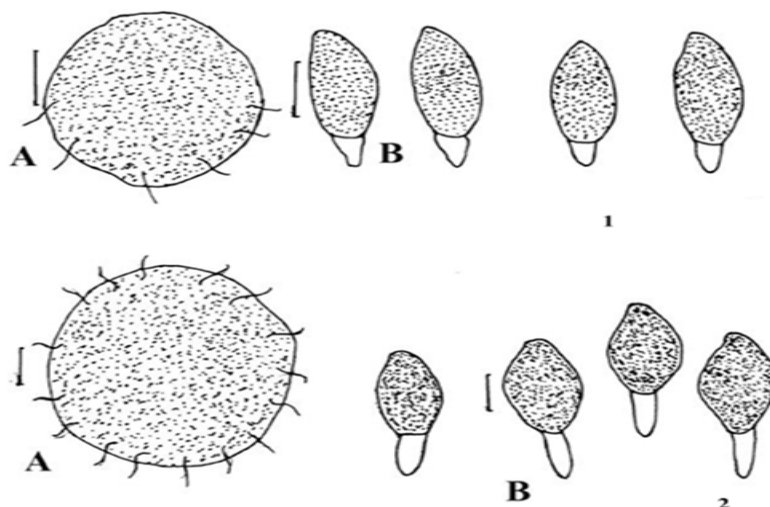


Fig. 1. *Zopfiella latipes*. A) A) Ascogonium (Scale Bar= 175µm) B). Ascospores (Scale Bar=10 µm)
Fig 2. *Zopfiella submerse* A). A) Ascogonium Scale Bar=150 µm) B) Ascospores (Scale Bar=10 µm)

ACKNOWLEDGEMENTS

The authors are thankful to Dr. S. N. Nandan, Principal and Dr. Sandhya Patil, Head, P. G. Department of Botany, S. S. V. P. Sanstha's L. K. Dr. P. R. Ghogrey Science college, Dhule, (M. S.), India for library and laboratory facilities.

REFERENCES

- [1] Park, D. 1972. On the ecology of heterotrophic micro-organisms in fresh-water. *Trans. Br. Mycol. Soc.* 58: 291-299.
- [2] Wong, M.K.M., Goh, T.K., Hodgkiss, I.J., Hyde, K.D., Ranghoo, V.M., Tsui, C.K.M., Ho, W.H., Wong, S.W. and Yuen, T.C. 1998. The role of fungi in freshwater ecosystems. *Biodivers. Conserv.* 7: 1187-1206.
- [3] Vijaykrishna, D., Jeewon, R. & Hyde, K.D. 2005. *Fusoidispora aquatica*: a new freshwater ascomycetes from Hong Kong based on morphology and phylogeny inferred from rDNA sequences. *Sydowia.* 57: 267-280.
- [4] Ingold, C.T. 1951. Aquatic Ascomycetes: *Ceriospora caudae suis* n. sp. and *Ophiobolus typhae*. *Trans. Br. Mycol. Soc.* 34: 210-215.
- [5] Ingold, C.T. 1954. Aquatic Ascomycetes: Discomycetes from lakes. *Trans. Br. Mycol. Soc.* 37: 1-18.
- [6] Ingold, C.T. 1955. Aquatic Ascomycetes: further from the English lake District. *Trans. Br. Mycol. Soc.* 38: 157-168.
- [7] Ingold, C.T. & Chaman, B. 1952. Aquatic Ascomycetes: *Loromyces juncicola* Weston and *L. macrospora* n. sp. *Trans. Br. Mycol. Soc.* 35: 268-272.
- [8] Pringsheim, N. 1858. Ueber das Austreten der Sporen von *Sphaeria scripi* aus ihren Schlauchen. *J. fur Wissen. Botanik.* 1: 189-921.
- [9] Manoharachary, C. & Rama Rao 1972. *Subbaromyces aquaticus*, a new ascomycete from India. *Hydrobiologia.* 49: 745-749.
- [10] Udaiyan, K. 1989. Some interesting ascomycetes from water cooling towers. *Kavaka.* 17: 11-16.
- [11] Udaiyan, K. & Hosagoudar, V.S. 1991. Some fungi from the industrial water cooling towers. *J. Econ. Tax. Bot.* 15: 627-647.
- [12] Borse B.D. & Pawara C.M. 2007. Freshwater ascomycetes from North Maharashtra-I. *Bioinfolet*, 4: 107-110.
- [13] Sridhar, K.R., Karamchand, K.S. & Hyde, K.D. 2010. Wood-inhabiting filamentous fungi in high-altitude streams of the Western Ghats by damp incubation and bubble chamber incubation. *Mycoscience*, 51: 104-115.
- [14] Kohlmeyer, J. & Kohlmeyer, E. 1979. Marine Mycology: The Higher Marine fungi. Academic press, New York. Pp. 689.
- [15] Borse, B.D., Patil, K. B., Patil, R. V. & Kelkar, D. J. 2000. Marine fungi in foam, intertidal wood and dead *Avicennia marina* wood from Daman Coast, India. *Geobios*, 13:42-44.
- [16] Borse, B.D. and Srivastava 1988. Marine fungi from India-VIII. *Indian Bot. Repr.* 7:26-30.
- [17] Borse, K. N., Pawar, N.B., Pawar, N.S. & Borse, B.D. 2005. Marine fungi from Orissa (India)-IV. In: Plant Diversity and Biotechnology, (Eds. Nandan et al.) Shripushpa Press, Dhule. Pp- 102-106.
- [18] Maria, G.L. & Sridhar, K. R. 2003. Diversity of filamentous fungi on woody litter of five mangrove plant species from the south west coast of India. *Fungal Diversity.* 14: 109-126.
- [19] Maria, G.L. & Sridhar, K. R. 2004. Fungal colonization of immersed wood in mangroves of the south west coast of India. *Can. J. Bot.* 82: 1409-1418.
- [20] Nambiar, G & Raveendran, K. 2007. Estuaries marine mycoflora of North Malabar (Kerala). *J. Mar. Atmos. Res.* 3: 29-31.
- [21] Nambiar, G & Raveendran, K. 2008. Marine and magnicolous fungal diversity in the coastal wetlands of Kerala. *Seaweed Res. Utiln.* 30: 107-111.
- [22] Nambiar, G & Raveendran, K. 2009. Lignicolous marine fungi in

- selected wetland of North malabar (Kerala) In: Compendium on wetland Biodiversity and Conservation (Eds. Bijoy Nandan S., Salim M., Somnathan Oillai G. & Reeny Varghese), Published by LAK, Irinjalakuda, Kerala-680125.Pp-136-140.
- [23] Nambiar, G , Raveendran, K., Zhao, C. & Jaleel, C. H. 2008. A glimpse of lignicolous marine fungi occuring in coastal water bodies of Tamil Nadu (India). *C.R. Biologie*. 331: 475-480.
- [24] Sarma,V.V.& Vittal,B.P.R.1998-99.Ecological studies on magnilicolous fungi from Godavari and Krishna deltas, East coast of India-observations on the seasonal occurrence. *Kavaka*. 26-27: 105-120.
- [25] Sarma, V.V. and Vittal, B.P.R. 2000. Biodiversity of mangroove fungi on different substrata of *Rhizophora apiculata* & *Avicennia* sp. From Godavari & Krishna deltas, East coast of India. In: Aquatic mycology across the Millenium (Eds K. D. Hyde, W.H. Ho & S.B. Pointing). *Fungal Diversity*. 5:23-41.
- [26] Sarma,V.V.& Vittal,B.P.R. 2001. Biodiversity of manglicolous fungi on selected plants in the Godavari and Krishna deltas, East coast of India. *Fungal Diversity*, 6: 115-130.
- [27] Sarma,V.V., Newell,S.Y. & Hyde,K.D. 2001. *Koorchaloma spartinicola* sp. Nov., a new marine sporodochial fungus from *Spartina alterniflora*. *Botanica Marina*.44: 321-326.
- [28] Sarma,V.V.& Vittal,B.P.R. 2004. Mafnicolous fungi recorded from Godavari and Krishna deltas, A.P., East coast of India along with dichotomus Key and notes on some taxa. *Kavaka*. 32: 65-111.
- [29] Vittal,B.P.R. & Sarma,V.V. 2005. Fungal Diversity on mangrooves. In: The fungi Diversity and conservation in India, (Eds. Dargan J. S. et al.), Bishen Singh Mahendra Pal Singh, Dehra Dun, (India).Pp-33-45.
- [30] Guarro, J., Al-Saadoon, A.H., Gene, J. & Abdullah, S.K. 1997. Two new cleistothecial Ascomycetes from Iraq. *Mycologia*. 89: 955-961.