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Freshwater Higher Fungi from Ahmednagar district (M.S., India) – II: Ascomycetes

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Abstract:
The present paper deals with 18 species of freshwater Ascomycetes encountered on submerged decaying woody debris and leaves of *Typha angustata* Chaub. and Bory from lotic and lentic habitats in Ahmednagar district (Maharashtra state). These include species of the genera: *Annulodara* (2 sp.), *Annulohiscus* (2 sp.), *Aseosaccullus* (1 sp.), *Caroiphora* (1 sp.), *Neoaniptodera* (1 sp.), *Neomassariosphaeria* (1 sp.), *Pinorbis* (1 sp.), *Pseudorbis* (1 sp.), *Saccoryella* (6 sp.) and *Zopfiella* (2 sp.). The data provides information on the distribution of these fungi in India, apart from descriptions and illustrations. This data will be useful in the compilation of freshwater biodiversity of India. The taxonomy, morphology and ecology of these fungi are discussed.
Keywords: Ascomycetes, Freshwater, Submerged wood, *Typha* sp.

Introduction:

Freshwater Ascomycetes (FWA) are defined as Ascomycetous fungi which have been recorded in freshwater habitats and which complete part, or the whole of their lifecycle within freshwater environments (Shearer, 1993; Thomas, 1996; Wong et al., 1998a; Luo et al., 2004). Lignicolous FWA inhabit submerged woody material in lentic (lakes, ponds, etc.) and lotic (rivers, streams, etc.) habitats, playing an important role in recycling organic matter in the freshwater ecosystems. The FWA is one of the least studied groups of fungi. Although sporadic reports of Ascomycetous fungi that colonize freshwater macrophytes occur in the early Ascomycete systematic literature. Late Prof. C.T. Ingold was the first to recognize that a distinctive FWA might exist and published a series of papers on FWA from submerged substrates in the Lake District, England (Ingold 1951, 1954, 1955; Ingold and Chapman, 1952).

Until the end of last decade, FWA have been studied mainly including Australia, Brunei, China, Hong Kong, Malaysia, USA, and UK (Zhang et al., 2011; Jones et al., 2014). In India, previous studies on FWA were made by Manoharachary and Rama Rao (1972), Manoharachary (1972), Tilak and Kulkarni (1974), Natarajan and Udaiyan (1978), Udaiyan (1989), Udaiyan and Hosagoudar (1991), Agarwal et al. (1991), Ramesh (2002), Ramesh and Vijaykumar (2000, 2004, 2005, 2006), Borse and Pawara (2007), Sridhar et al. (2010, 2011a), Sudheep and Sridhar (2011), Patil (2012a), Patil and Borse (2011a, 2012a, b), Upadhyaya et al. (2012), Borse et al. (2014a, 2014b, 2015) and Borse and Patil (2015). The objective of the present study was to study the diversity of FWA from Ahmednagar district of Maharashtra state. In the present paper 18 species (Table 2) of FWA collected on submerged decaying woody debris and leaves of *Typha angustata* Chaub. and Bory from lotic (streams, rivers etc.) and lentic (lakes, dams etc.) habitats were briefly described and illustrated. The most specious genus encountered is *Saccoryella* with 6 species.

Materials and Methods:

Sample of submerged decaying woody debris and leaves of Typha sp. were collected from various localities along rivers such as Mula, Pravara, Godavari, Sina, Bhima, Kukadi, Mahata, Ghod and reservoirs such as Bhandardara, Dnyaneshwarsagar, and Nathsagar. The survey was undertaken for four years during 2011-2014. The samples were analyzed by wood analysis method. Samples were collected and placed in polythene bags and transported to the laboratory. Samples contaminated by sediments or fouling organisms were washed with tap water and observed for Ascocarps. After initial observations, samples were incubated in sterile plastic boxes containing layer of blotting paper or sterile sand moistened with sterile water. A few Naphthalene balls were placed in suitable container inside of plastic box, to kill any insect in the wood. Distil water was added as if necessary to prevent the substratum form drying out. The water was sprayed on samples with a fine aerosol spray. Plastic boxes tied with rubber band and placed in polythene bags to conserve a humid

atmosphere within boxes. All samples were examined periodically and remoistened whenever necessary and after three weeks examined for the presence of fruiting bodies / Ascocarps. Semi-permanent slides of fungi isolated were made for further observations.

Samples were observed initially under 30 X magnifying hand lens. Ascocarps then removed from the wood sample with fine pair of forceps or needle with a fine point. Ascocarps were mounted in the first instant in water, so that any appendages present on ascospores can get dilated and their true morphology determined. If ascospores are mounted directly in lacto - phenol, may lead to misidentification of the species. Semi-permanent mount of the fungi were made by replacing the Lacto phenol (with or without Cotton Blue) in place of water, by placing a drop of the mounting fluid to one side of the cover glass so that it sweeps under the cover glass. Excess mounting medium was cleaned through blotting paper. The cover glass was sealed with D.P.X. for temporary mounts. Permanent voucher slides of fungi were prepared according to the method 'double cover glass' described by Volkmann-Kohlmeyer and Kohlmeyer (1996).

TAXONOMIC ACCOUNT

1) **Aniptodera chesapeakensis** Shearer & M.A. Miller, Mycologia, 69: 894 (1977); (Fig. 1).
Ascomata: 150-225 µm high, 200-300 µm in diam.; *Asci*: 120 x 15-35 µm; *Ascospores*: 23-35 x 8-15 µm, 2-3-seriate, ellipsoidal or fusiform, 1-euseptate, not constricted at the septum, hyaline, smooth, thick-walled, guttulate, with or without polar appendages; appendages filamentous, unfurling in water, long or short.
Habitat: On submerged wood, Mula Dam, Mula River, Rahur, 22 Feb. 2012.
Distribution in India:-
Marine Habitats: *West Coast*:- Maharashtra, Goa, Karnataka, Pondecherry (Mahe); *East Coast*:- Tamil Nadu, Andhara Pradesh, West Bengal, Andaman-Nicobar Islands (Borse et al., 2012, 2013).
Freshwater Habitats: *Karnataka*: (Ramesh and Vijaykumar, 2006; Sudheep and Sridhar, 2011); *Maharashtra*: (Patil and Borse, 2012b).

2) ***Aniptodera inflatiascigera*** K.M. Tsui, K.D. Hyde & L.J. Hodgkiss, *Sydowia*, **49**: 187-192 (1997); (Fig. 2)
Ascomata: 180-300 µm in diam., *Asci*: 135-200 x 15-35 µm; *Ascospores*: 35-40 x 15-20 µm, hyaline, ellipsoidal, bicelled, not constricted at the septum, relatively thick-walled (2-3 µm thick), with or without polar appendages; delicate, released from the pores at the ascospore tips.
Habitat: On submerged wood, Bhandardara dam, Pravara river, 28 March 2011.
Distribution in India:- *Maharashtra*: (Borse and Patil, 2015).

3) ***Annulutascus hongkongensis*** W.H. Ho, Ranghoo, K.D. Hyde & L.J. Hodgkiss, *Mycologia*, **91**: 886 (1999); (Fig.3)
Ascomata: 250-280 µm diam., 210-250 µm high; *Asci*: 250-275 x 25-30 µm; *Ascospores*: 35-38 x 13-15 µm, uniseriate or overlapping uniseriate, hyaline, ellipsoidal, 3-septate, guttulate, smooth, thin-walled with thick mucilagnous sheath (6-8 µm thick).
Habitat: On submerged wood, Bhandardara dam, Pravara river, 29 July 2012.
Distribution in India:- *Maharashtra*: (Borse et al., 2014a).

4) ***Annulatascus palmietensis*** Goh, K.D. Hyde & Sseinke, In: Hyde et al., *S. Afr. J. Bot.*, **64**: 151 (1998); (Fig. 4)
Ascomata: 250-400 µm diam.; *Asci*: 100-130 x 8-12 µm; *Ascospores*: 20-25 x 6-7 µm, 1-2 seriate, short fusiform, ends blunt, 3- septate in mature specimens, hyaline, appearing smooth-walled.
Habitat: On submerged wood, Bhandardara dam, Pravara river, 15 August 2013.
Distribution in India:- *Maharashtra*: (Borse et al., 2014a).

5) ***Ascosacculus heterogattulata*** (S.W. Wong, K.D. Hyde & E.B.G. Jones) J. Campb., J.L. Anderson & Shearer, *Mycologia*, **95**: 545 (2003) = *Halosarpheia heterogattulata* S.W. Wong, K.D. Hyde & E.B.G. Jones, *Can. J. Bot.*, **76**: 1858 (1998b); (Fig. 5);
Ascomata: 120-160 µm in diam.; *Asci*: 8-spored, deliquescing early; *Ascospores*: 25-35 x 9-17 µm, ellipsoidal, hyaline, 1-septate, equally two-celled, apical cell with one or two large lipid guttule(s), basal cell with numerous small guttules, with bipolar, hamate, and highly coiled filamentous appendages that unferl in water to form long strands.
Habitat: On submerged wood, Mula dam, Mula river, Rahuri, 28 August 2011.
Distribution in India:- *Karnataka*: On submerged wood (Sridhar et al., 2011a); *Maharashtra*: (Borse and Patil, 2015).

6) *Cercophora* sp. (Fig. 6)
Ascomata: 1.5 mm in diam, 2.5 mm in high; *Asci*: when young cylindrical, 150-215 x 8-10 µm, at maturity clavate, 120-130 x 12-20 µm; *Ascospores*: cylindrical, 43-48 x 4-5 µm., sigmoid to geniculate, hyaline, aseptate, bipolar appendages long, 25-30 µm, gelatinous, lash-like, becoming differentiated into an apical swollen head and a basal pedicel while inside the ascus; head ellipsoid, 12-18 x 8-10 µm, conical at the apex, truncate at the base, hyaline; pedicel 20-30 µm long, 4.5 µm in diam., up to 3-septate, hyaline; ascospores up to 5-septate after liberation from the ascus.
Habitat: On wood in Jayakwadi dam, Godavari river, Deokane, 25 Sept. 2011.

7) *Natantispora retorquens* (Shearer & J.L. Crane) J. Campb., J.L. Anderson & Shearer *Mycologia*, **95:** 543 (2003); = *Halosarpheia retorquens* Shearer & J.L. Crane, *Bot. Mar.*, **23:** 608 (1980). (Fig. 7)
Ascomata: 140-325 x 150-360 µm.; *Asci*: 50-145 x 15-25 µm; *Ascospores*: 20-35 x 7-12 µm, ellipsoidal, hyaline, 1-septate, appendaged. Appendages: bipolar, composed of single, coiled or folded filament, at first hamate, finally unwinding in water to produce a long fine filament.
Habitat: On submerged wood, Bhandardara dam, Pravara river, 20 August 2012.
Distribution in India:- *Marine Habitats:*- West Coast:-Maharashtra, Karnataka, Kerala (Borse et al., 2012, 2013). *Freshwater Habitats: Maharashtra:* (Patil and Borse, 2012a).

8) *Neomassariosphaeria typhicola* (P. Karst.) Yin, Zhang, F. Fourn. & K.D. Hyde, In: Zhang et al., *Studies Mycology*, **64:** 96 (2009); (Fig. 8)
Ascomata: 180-220 µm high, 200-425 µm diam., *Asci*: 100-130 x 20-25 µm; *Ascospores*: 35-50 x 7-10 µm, bi- or tri-seriate in the upper part of the ascus, uni-seriate below, fusiform, 7-11-septate, slightly constricted at the septa, particularly around the thickest cell (4th or 5th from the top), straight or curved, at first hyaline, becoming light brown and verrucose in age, surrounded by a gelatinous, 2 to 4 µm thick sheath.
Habitat:- On submerged decaying leaves of *Typha angustata* Chaub. and Bory, Mula river, Rahuri, 30 September 2011.
Distribution in India:- Marine waters: East Coast:- *Andhara Pradesh:* On intertidal wood of *Rhizophora apiculata* (Sarma and Vittal, 2004); Freshwater habitats: *Maharashtra:* (Borse and Patil, 2015).

9) *Panorbis viscosus* (L. Schmidt) J. Campb., J.L. Anderson & Shearer, *Mycologia*, **95**: 544 (2003); = *Halosphaeria viscosus* L. Schmidt, *Natur und Natur. in Mecklenburg*, **12**: 70 (1974) 1979 and *Mycotaxon*, **24**: 420 (1985); = *Halosarpheia viscosus* (L. Schmidt) Shearer & J.L. Crane, *Bot. Mar.*, **23**: 608 (1980); (Fig. 9)
Ascomata: 200-450 x 200-385 µm; *Asci*: 50-115 x 10-25 µm; *Ascospores*: 15-26 x 5-8 µm, hyaline, 1-septate, ellipsoidal, appendaged. *Appendages*: bipolar, composed of a single, coiled filament, at first hamate, unwinding in water to produce a long fine filament.
Habitat:- On submerged wood, Mula dam, Mula river, Rahuri, 30 September 2012.
Distribution in India:- *Marine Habitats*: West Coast:- Maharashtra, Karnataka, Kerala; East Coast:- Tamil Nadu, Andhara Pradesh (see Borse et al., 2012; 2013); *Freshwater Habitats: Maharashtra*: On submerged wood (Patil and Borse, 2012a)

10) *Paoayensis* sp. (Fig. 10)
Ascomata: 700-1000 µm high, 800-1000 µm diam.; *Asci*: 85-170 × 40-65 µm; *Ascospores*: 50-80 × 20-38 µm, overlapping, lemoniform,1-3-septate, first septum formed near the base, second septum central, third septum near the rounded apex, brown, dark-brown at maturity, germ slit 10-12 µm long, not full length, arising from the base, perpendicular to the ascospore, smooth-walled, and lacking a mucilaginous sheath.
Habitat: On submerged wood, Jayakwadi dam, Godavari river, Deokane, 15 Aug., 2012.
Remarks: The general characteristics of the present collection fit within the concept of the monotypic genus *Paoayensis* Cabanela et al. (2007). The present fungus differed markedly from the type species as provided in the table 1. The ascomata and Asci of the present collection are larger than those of type species. Asci in the type species are 2-6 spores and 4-8 spored in the present collection. Ascospores of the type species are wider than the present collection. However, due to lack of material, cultural studies and molecular sequencing, the present collection was not described as new species.
11) *Savoryella aquatica* K.D. Hyde, *Aust. Syst. Bot.*, **6:** 162 (1993); (Fig. 11)
Ascomata: 200-250 µm long, 100-125 µm diam.; *Asci*: 110-140 x 25-35 µm; *Ascospores*: 29-35 x 13-17 µm, ellipsoidal, central cells dark brown when mature, end cells hyaline, constricted weakly at the septa, central septa appearing as a band.

Habitat: On submerged wood, Bhandardara dam, Pravara river, 15 August 2014.
Distribution in India:- *Maharashtra*: On submerged wood (Borse and Pawara, 2007).

12) *Savoryella fusiformis* W.H. Ho, K.D. Hyde & I.J. Hodgkiss, *Mycol. Res.*, **101:** 804 (1997); (Fig. 12)
Ascomata: 150-200 µm long, 70-90 µm diam.; *Asci*: 80-120 x 10-13 µm; *Ascospores*: 25-35 x 6-9 µm, fusiform, biseriate, 3-septate, slightly constricted at the septa, smooth, thin-walled; central cells brown, apical cells 4-5 µm long, 4-5 µm wide, hyaline.
Habitat: On submerged wood, Mula dam, Mula river, Rahuri, 18 August 2013.
Distribution in India:- *Maharashtra*: On submerged wood (Patil and Borse, 2011a).

13) *Savoryella grandispora* K.D. Hyde, *Mycoscience*, **35:** 59-61 (1994b); (Fig. 13)
Ascomata: 200-260 µm long, 100-1125 µm diam.; *Asci*: 100-140 x 25-35 µm; *Ascospores*: 45-60 x 14-16 µm, ellipsoidal, biseriate, light brown, central cells dark brown when mature, end cells hyaline, constricted weakly at the septa.
Habitat:- On submerged wood, Bhandardara dam, Pravara river, 10 September 2013.
Distribution in India:- *Maharashtra*: On submerged wood (Patil and Borse, 2011a).

14) *Savoryella lignicola* E.B.G. Jones & R.A. Eaton, *Trans. Br. Mycol. Soc.*, **52:** 162 (1969); (Fig. 14)
Ascomata: 200-340 µm high, 120-180 µm in diam.; *Asci*: 130-180 x 15-54 µm; *Ascospores*: 25-35 x 9-13 µm, uni or biseriate, ellipsoidal, 3-septate, not markedly constricted at the septa; central cells brown, apical cells smaller and hyaline.
Habitat: On submerged wood, Mula dam, Mula river, Rahuri, 10 September 2013.
Distribution in India:- *Marine Habitats*:- West Coast:-Daman, Gujarat, Goa, Karnataka, Pondecherry (Mahe), Kerala, Lakshadweep Islands; East Coast:-Tamil Nadu, Pondecherry, Andhara Pradesh, West Bengal, Andaman & Nicobar Islands (see Borse et al., 2012; 2013).
Freshwater Habitats: *Tamil Nadu*: (Udaiyan, 1989; Udaiyan and Manian, 1991b); (Udaiyan and Manian, 1991a); *Karnataka*: (Ramesh and Vijaykumar, 2000; Ramesh and Vijaykumar, 2006; Sridhar et al., 2011a; Sudheep and Sridhar, 2011); *Maharashtra*: (Borse and Pawara, 2007).

15) *Savoryella limnetica* H.S. Chang & S.Y. Hsieh, *Mycol. Res.*, **102:** 713 (1998); (Fig. 15)
Ascomata: 250-300 x 160-200 µm; *Asci*: 145-150 x 10-12 µm; *Ascospores*: 20-25 x 7-9 µm, ellipsoidal, 3-septate, not constricted, smooth, thin-walled, central cells brown, end cells smaller and hyaline to sub-hyaline.
Habitat:- On submerged wood, Bhandardara dam, Pravara river, 24 August 2014.
Distribution in India:- *Maharashtra*: On submerged wood (Patil and Borse, 2011a).

16) *Savoryella verrucosa* Minoura & T. Muroi, *Trans. Mycol. Soc. Japan*, **19:** 132 (1978); (Fig. 16)
Ascomata: 250-325 µm long, 150-250 µm diam.; *Asci*: 170-200 x 22-35 µm; *Ascospores*: 30-40 x 12-18 µm, biseriate, ellispodal, 3-septate when mature, constricted at the septa; central cells brown, distinctly verrucose, polar cells 3.8-6.4 µm long, 4-5 µm wide, hyaline.
Habitat:- On submerged wood, Mula dam, Mula river, Rahuri, 24 August 2014.
Distribution in India:- *Karnataka*: On submerged wood (Sridhar et al., 2011a); *Maharashtra*: On submerged wood (Patil and Borse and Patil, 2015).

17) *Zopfiella karachiensis* (S.L. Ahmed & Asad) Guarro, in: Guarro and Cano, *Trans. Br. Mycol. Soc.*, **91:** 580 (1988); = *Strattonia karachiensis* S.L. Ahmed & Asad, *Sydowia*, **21:** 282 (1968); = *Podospora faureli* Mouchacca, *Rev. Mycol.*, **38:** 109 (1973); = *Triangularia karachiensis* (S.L. Ahmed & Asad) Udagawa, *Trans. Mycol. Soc. Japan*, **20:** 362-365 (1979); (Fig. 17)
Ascomata: 300-375 x 280-285 µm.; *Asci*: 100-135 x 15-25 µm; *Ascospores*: biseriate, ellipsoidal, at first 1-celled, latter becoming 2-celled, 35-40 x 12-20 µm; upper cell dark olivaceous brown to dark brown, ellipsoid, inequilateral, smooth, with a single germ pore at the apex, 25-30 x 12-20 µm; lower cell conical, hyaline often collapsed at maturity, 7-10 x 7-9 µm.
Habitat: On submerged wood, Bhandardara dam, Pravara river, 24 August 2014.
Distribution in India:- *Tamil Nadu*: On wood test blocks (as *Triangularia karachiensis*, Udaiyan 1989; Udaiyan and Manian, 1991b); *Maharashtra*: (Borse and Patil, 2015).

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18) *Zopfiella latipes* (N. Lundq.) Malloch & Cain, *Can. J. Bot.*, **49**: 876 (1971); (Fig. 18)

Ascomata: 120-700 µm in diam.; *Asci*: 80-120 x 12-18 µm; *Ascospores*: biseriate, ellipsoidal, becoming 1-septate in the lower third; slightly constricted at the septum; larger upper cell 16-22 x 10-13 µm, ellipsoidal, apex conical or abonate, base truncate, olivaceous to brown, thin-walled, smooth, with a apical germ pore, smaller lower cell 4-8 µm long, 3-7 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:- On submerged wood, Bhandardara dam, Pravara river, 24 August 2014.

Distribution in India:- *Marine Habitats*:- West Coast:- Gujarat, Maharashtra, Karnataka, Pondecherry (Mahe); East Coast:- T.N., A.P. (see Borse et al., 2012, 2013).

Freshwater habitats:- *Tamil Nadu*: (Udaiyan, 1989; Udaiyan and Manian, 1991b); *Karnataka*: (Ramesh and Vijaykumar, 2000, 2006; Sridhar et al., 2010, 2011a); *Maharashtra*: On submerged wood (Patil, 2012).

Table No. 1. Comparison of type species and present collection

Particulars	*Paoayensis lignicola* Cabanela, Jeewon & K.D. Hyde	*Paoayensis* sp.
Ascomata	*Ascomata*: 546-626 µm high, 520-586 µm diam.	700-1000 µm high, 800-1000 µm diam.
Asci	45-130 × 13-35 µm, 2-6 spored	85-170 × 40-65 µm, 4-8 spored
Ascospores	41.9- 79.9 × 6.7- 14.4 µm	50-80 × 20-38 µm
References	Cabanela et al., (2007).	This study

Table No. 2. List of Freshwater Ascomycetes from Ahmednagar District with substrata. (SL- Submerged leaves: 01, SW- Submerged wood: 17 sp.)

Sr. No.	Name of the fungus	SL	SW
1	*Aniptodera chesapeakensis* Shearer & M.A. Miller	-	+
2	*Aniptodera inflatoascigera* K.M. Tsui, K.D. Hyde & Hodgkiss	-	+
3	*Annulatascus hongkongensis* Ho et al.	-	+
4	*Annulatascus palmetensis* Goh, K.D. Hyde & Hodgkiss	-	+
5	*Ascosacculus heterogemmata* (S.W. Wong et al.) J. Camph. et al.	-	+
6	*Cercophora* sp.	-	+
7	*Natantispora retorquens* (Shearer & J.L. Crane) J. Camph. et al.	-	+
8	*Neomassariosphaeria typhicola* (P. Karst.) Yin et al.	-	+
9	*Panorbis viscosus* (I. Schmidt) J. Camph. et al.	+	-
10	*Paoayensis* sp.	-	+
11	*Savoryella aquatica* K.D. Hyde	-	+
12	*Savoryella fusiformis* W.H. Ho, K.D. Hyde & Hodgkiss	-	+
13	*Savoryella grandispora* K.D. Hyde	-	+
14	*Savoryella lignicola* E.B.G. Jones & R.A. Eaton	-	+
15	*Savoryella limnetica* H.S. Chang & S.Y. Hsieh	-	+
16	*Savoryella verrucosa* Minoura & T. Muroi	-	+
17	*Zopfiella karachiensis* (S.I. Ahmed & Asad) Guarro	-	+
18	*Zopfiella latipes* (N. Lundq.) Malloch & Cain	-	+

Results and Discussions:

A list of 93 species (including 25 species of *Chaetomium*) of Freshwater Ascomycetes which have been identified to species level is provided by Borse et al. (2014b). According to Cai et al. (2014) *Chaetomium*, the most specious genus recorded from freshwater habitats all over the world, none of which have been described originally from freshwater, and thus may not be necessarily be true aquatic species, and hence not included in this paper. The most specious genera in India are *Savoryella* with (6 sp.), *Leptosphaeria* (4 sp.), *Zopfiella* (4 sp.), *Aniptodera* (4 sp.), *Annulatascus* (3 sp.), *Lophiostoma* (3 sp.), *Pleospora* (2 sp.) and *Jahnula* (2 sp.). Some common FWA such as *Aniptodera chesapeakensis* Shearer & Miller, *Natantispora retorquens* (Shearer & J.L. Crane) J. Camph. et al., *Panorbis viscosus* (I. Schmidt) J. Camph. et al., *Savoryella aquatica* K.D. Hyde, and *Zopfiella latipes* (N. Lundq.) Malloch

& Cain can be found at nearly every site investigated in Ahmednagar district. Most records of FWA were from states of Tamil Nadu (46 sp.), Karnataka (33 sp.), and Maharashtra (18 sp.), represent intensity of studies.

Studies on the FWA in Ahmednagar district have yielded 18 species belonging to ten genera. Out of which, 17 species were encountered on submerged decaying woody debris and one species on submerged decaying leaves of *Typha angustata* Chaub. and Bory. Aquatic Ascomycetes described by Tilak and Kulkarni (1974) from Maharashtra are not accepted as FWA as they were collected on living leaves of *Typha angustata* Chaub. and Bory. The species: *Aniptodera chesapeakensis* Shearer & M.A. Mill., *Natantispora retorquens* (Shearer & J.L. Crane) J. Campb. et al., *Panorbis viscosus* (L. Schmidt) J. Camph. et al., *Savoryella lignicola* E.B.G. Jones & R.A. Eaton, *Zopfiella latipes* (N. Lundq.) Malloch & Cain were recorded from both marine and freshwater habitats in India (Borse, et al., 2012, 2013b, 2014b).

As aquatic habitats are increasingly altered and degraded, it is imperative that the freshwater fungal species of the remaining high quality aquatic habitats be characterized and isolated. Such baseline information is essential to understand the role of fungi in aquatic habitats and how fungi could be used in the remediation of damaged aquatic habitats. It is clear those additional collections from worldwide, especially in tropical areas and along altitudinal gradients, are needed to fully characterize the biodiversity, geographical distribution pattern, systematics and evolution of freshwater Ascomycetes (Jones et al., 2014). In summary, we hope that the information presented herein will prompt future studies to document Freshwater Ascomycetes of India.

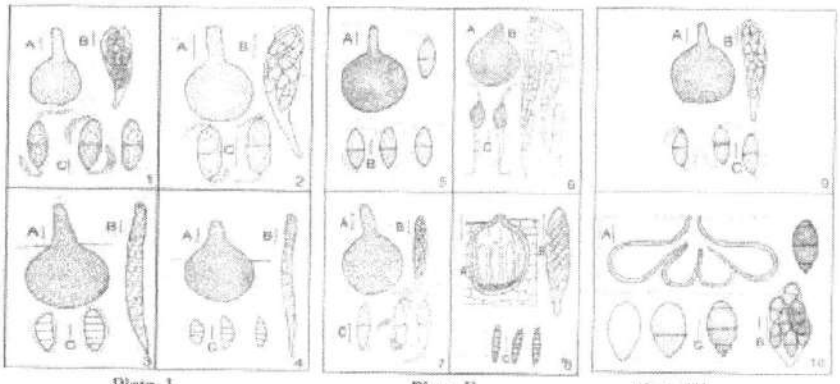

Plate. I

Plate. II

Plate. III

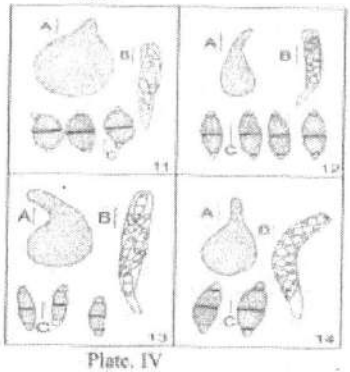

Plate. IV

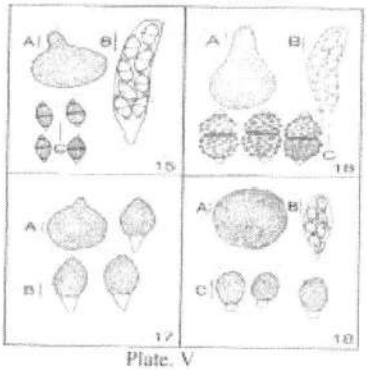

Plate. V

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