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Biodiversity of freshwater Mitosporic fungi from Thane District, Maharashtra, India – I

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Abstract
The present paper deals with seven species of freshwater Hyphomycetes: *Anguillospora crassa*, *Anguillospora gigantea*, *Anguillospora longissima*, *Articulospora tetracladia*, *Campylospora filicladia*, *Clavariana aquatica* and *Clavariopsis aquatica* collected from Thane district of Maharashtra state, India. These taxa were encountered in foam samples from lotic habitats of Thane districts. The data provides information on the distribution of these fungi in Maharashtra, apart from their description and illustrations.

Keywords: Mitosporic fungi, foam samples, Ingoldian fungi

Introduction
The concept of biodiversity encompasses the entire biological hierarchy from molecule to ecosystem. It includes the entities recognizable at each level (gene, species, communities etc.) and the interactions between them (nutrient and energy-cycling, predation, competition, mutation, adaptation etc.). These entities are heterogonous, meaning that all members at each level can be distinguished from one another (Eldredge and Salthe, 1984) [9].

Materials and Methods
Foam samples were collected from lotic habitats in Thane district at morning and evening times. Sample were placed in clean plastic bottles and kept for 24 hours to enable the foam to dissolve. It was preserved by adding FAA. Then samples were returned to the laboratory and observed under research microscope for the presence of conidia of Hyphomycetes. The permanent slides were prepared as suggested by Volkmann- Kohlmeyer and Kohlmeyer (1996) [21]. Identification of freshwater Mitosporic fungi were confirmed with the help of monographic literature such as, Ingold (1975) [13], Carmichael *et al*. (1980) [7], Webster and Descals (1981) [2], Cai *et al*. (2003, 2006) [5, 6], Marvanova and Descals (2011) [17], and Marvanová and Laichmanová (2014) [18]. Reports of fungi from India and Maharashtra were confirmed with the help of Kamat *et al*. (1971) [15], Bhide *et al*. (1987) [1], Mahabale (1987) [16], Bilgrami *et al*. (1981, 1991) [22], Jamaludden *et al*. (2004) [14], Borse *et al*. (2017) [4] and other relevant literature.

Taxonomic account
1) *Anguillospora crassa* Ingold (Conidium: Fig. I; Photo I).
Trans. Br. Mycol. Soc., 41- 367 (1958b).
Conidia are terminal, hyaline, sigmoid, S- or L-shaped, 5-10-septate, 120-200 µm long, 15-20 µm wide, tapering to 8-10 µm at the ends.

Material examined: Conidia in foam sample, Bhatsa river (at Atgaon); S. A. Gosavi 1140 (PGDB); 22 June 2014.

Distribution in India: Karnataka, Uttarakhand, Maharashtra, Kerala, Andhra Pradesh, Gujarat and Madhya Pradesh (Source: Borse *et al*. 2017) [4].

Remarks: The descriptions of conidia are agreed with that of *A. crassa* Ingold (1958) [12]. Hence, it is assigned to that species. It is being reported for the first time from Thane district.

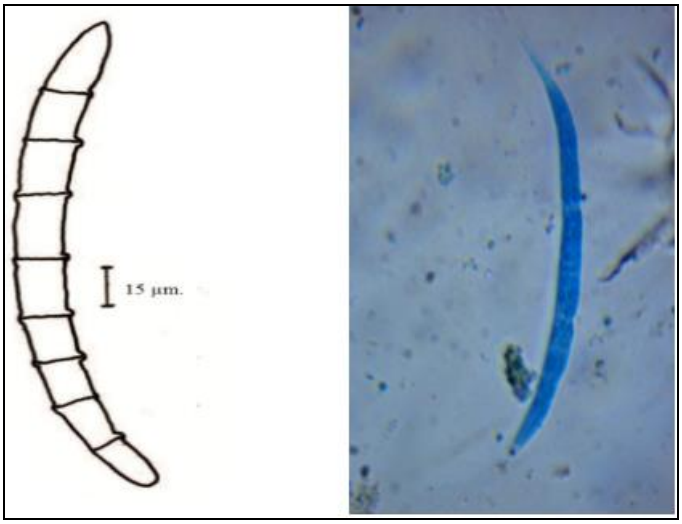

Fig 1

2) *Anguillospora gigantea* Ranzoni (Conidium: Fig. II; Photo.II).
Farlowia, 4- 363 (1953).
Conidia are hyaline, sigmoid or falcate, scolecosporus, 150-750 µm long, 5-6 µm broad in the middle and tapering gradually to 2.5-3 µm broad at the tips, 6-10 celled, shed by disarticulations and rounding off process of one of the terminal septa of the conidiophore.

Material examined: Conidia in foam samples, Tansa River (at Vajreshwari); S. A. Gosavi 1141 (PGDB); 08 Sept. 2013.

Distribution in India: Karnataka (Source: Borse *et al*. 2017) [4].

Remarks: The specimen fits well within the genus *Anguillospora* Ingold and agrees well with *A. gigantea* Ranzoni (1953) [20]. Therefore, it is assigned to that species. It is being recorded for the first time from Maharashtra.

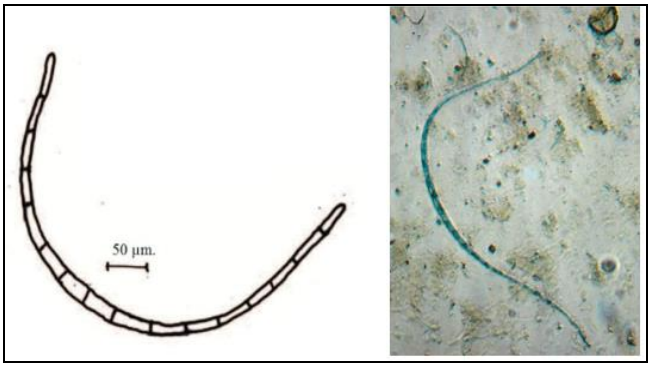

Fig 2

3) *Anguillospora longissima* (Sacc. & P. Syd.) Ingold
Trans. Br. Mycol. Soc., 25- 401 (1942); (Conidium: Fig. III; Photo.III)
Conidia are eel-like, 200-350 µm long, 5-6 µm broad in the middle region, tapering to 3-4 µm broad at the ends, 6-10-septate, curved or sigmoid, hyaline, separating when mature by the breakdown of a small 'separating cell' at the end of the conidiophore.

Material examined: Conidia in foam samples, Bhatsa (at Atgaon); S. A. Gosavi 1142 (PGDB); 08 Sept. 2013.

Distribution in India: Maharashtra, Tamil Nadu, Uttarakhand, Karnataka, Andhra Pradesh and Gujarat (Source: Borse *et al*. 2017) [4].

Remarks: The specimen fits well within the genus *Anguillospora* Ingold and agrees well with *A. longissima* (Sacc. & P. Syd.) Ingold (Ingold, 1942) [10]. Hence, it is assigned to that species. It is being recorded for the first time from the study area.

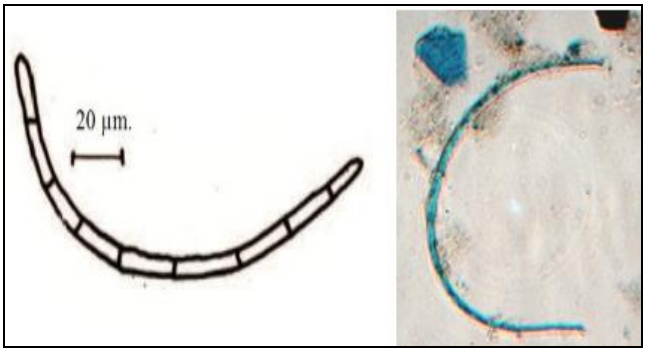

Fig 3

4) *Articulospora tetracladia* Ingold (Conidium: Fig. IV; Photo.IV).
Trans. Br. Mycol. Soc., 25- 372 (1942).
Conidia are hyaline, of four long divergent arms; the first formed arm 20-35 µm long, 3 µm broad, 1-2-septate; the other three arms 50-75 µm long, 3 µm broad, 1-3-septate, each with a narrow constriction or isthmus where it joins the short arm. These four arms arise in succession.

Material examined: Conidia in foam samples, Kalu river (at Bapsai); S. A. Gosavi 1144 (PGDB); 18 Aug., 2014.

Distribution in India: Maharashtra, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh and Uttarakhand (Source: Borse *et al*. 2017) [4].

Remarks: The specimen fits well within the genus *Articulospora* Ingold and agrees well with *A. tetracladia* Ingold (1942) [10]. Hence, it is assigned to that species. It is being recorded for the first time from the study area.

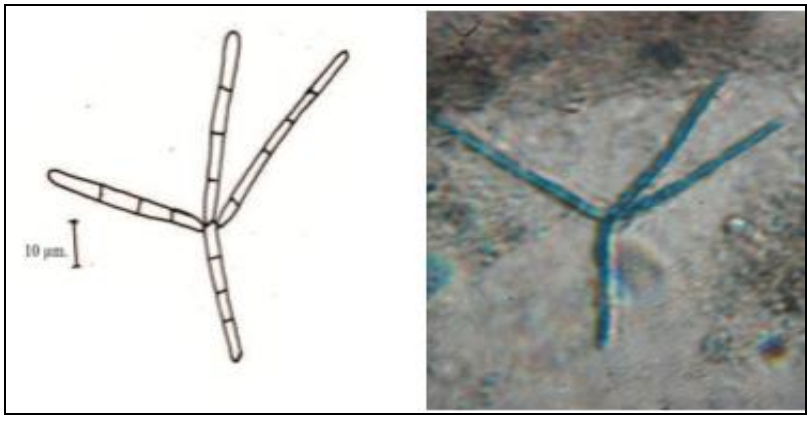

Fig 4

5) *Campylospora filicladia* Nawawi (Conidium: Fig. V; Photo V).
Trans. Br. Mycol. Soc., 63- 603 (1974).
Conidia are consisting of two distinct halves. The proximal half is triangular, 4-celled, 6-7 µm high and 10-12 µm wide. The distal half is allantoid, 4-celled, 9-13 µm long and 3-4.5 µm wide. Viewed either from the top or bottom, the conidia are more or less rectangular, 4-4.5 µm thick with a round or conical projections at each corner. The appendages arising from the end cells are lie along the long axis. The projection opposite the origin of each appendage is bigger and rounder. The two appendages at the top of the conidium are usually longer (15-35 µm) than the lateral appendages (7-17 µm). They are always directed opposite each other and are more or less

perpendicular to the lateral appendages. Surface view of the conidia always shows these two appendages to be in a crossed position.

Material examined: Conidia in foam samples, Pinjal river (at Wada); S. A. Gosavi 1145 (PGDB); 18 Aug., 2014.

Distribution in India: Maharashtra, Karnataka and Tamil Nadu (Source: Borse *et al*. 2017) [4].

Remarks: The descriptions and measurements of conidia are completely agreed with that of *C. filicladia* Nawawi (1974) [19]. Therefore, it is assigned to that species. It is being reported for the first time from Thane district.

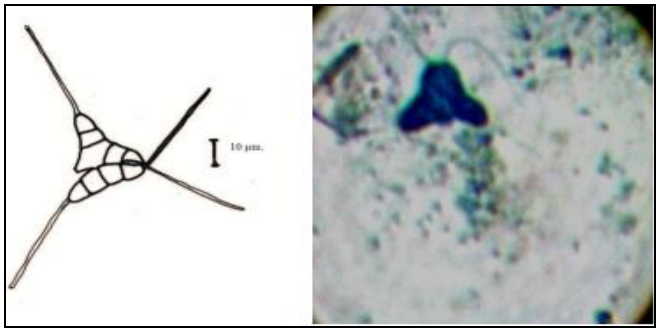

Fig 5

6) *Clavariana aquatica* Nawawi (Conidium: Fig.VI; Photo.VI).

In- Descals *et al*. *Trans. Br. Mycol. Soc*., 67- 217 (1976).

Conidia are obpyriform to broadly clavate, 5-8 µm wide at the base, broadening to 24-33 µm above; three arms are more or less of the same length develop from its crown, 53-160 µm long, 3-5 µm at its widest point and tapering to 2-2.5 µm at the apex, 0-2-septate; forth arm arises through the detachment scar with same length as the rest of the arms, with age the central body becomes highly vacuolated.

Material examined: Conidia in foam samples, Murawadi river (at Saralgaon); S. A. Gosavi 1147 (PGDB); 09 Dec. 2012.

Distribution in India: Uttarakhand, Karnataka and Gujarat (Source: Borse *et al*. 2017) [4].

Remarks: The descriptions and measurements of conidia are completely agreed with that of *C. aquatica* Nawawi (In-Descals *et al*. 1976) [8]. Hence, it is assigned to that species. It is being reported for the first time from Maharashtra.

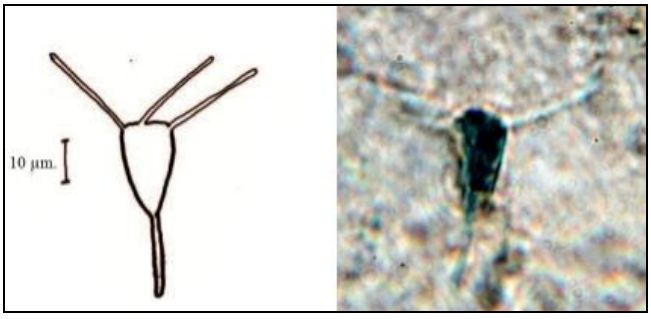

Fig 6

***7) Clavariopsis aquatica* De Wild. (Conidium : Fig.VII ; Photo VII).**

Ann. Soc. Belge Microsc., 19- 197, 1985.

Conidia are tetra-radiate, obclavate, hyaline, 1-septate, 22-25 µm long, 10-14 µm wide at the apex, 3-4 µm wide at the base, with 3 long, narrow, divergent appendages 50-65 x 1.5 µm and developing from the tip.

Material examined: Conidia in foam samples, Murvadi river (at Saralgaon); S. A. Gosavi 1148 (PGDB); 23 Sept., 2012.

Distribution in India: Uttarakhand, Andhra Pradesh, Utter Pradesh, Karnataka, Maharashtra and Madhya Pradesh (Source: Borse *et al*. 2017) [4].

Remark: The descriptions of conidia are agreed with that of *C. aquatica* De Wildeman (Ingold, 1942) [10]. Therefore, it is assigned to that species. It is being recorded for the first time from the study area.

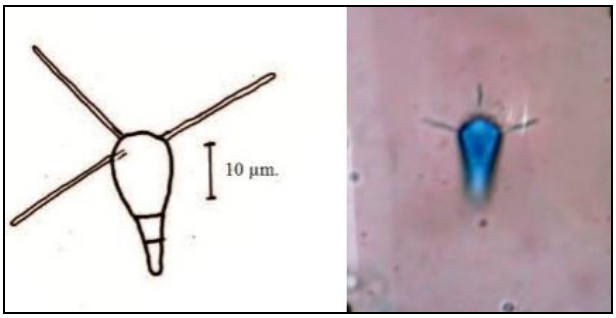

Fig 7

8) *Dendrospora erecta* Ingold (Conidium- Fig. VIII; Photo VIII).

Trans. Br. Mycol. Soc., 26- 106 (1943a).

Conidia are hyaline, septate, branched; main axis 150-300 µm long, 4-5 µm broad, continuous with the conidiophore; secondary branches 6-12 in number, 50-180 µm long, 4-5 µm broad, constricted at the base to 2 µm broad, arising (usually in pairs or in whorls of three) from the lower part of the main axis; tertiary branches, which may arise from the lowermost secondary branches, 10-90 µm long, 4-5 µm broad.

Material examined: Conidia in foam samples, Tansa river (at Ganeshpuri); S. A. Gosavi 1149 (PGDB); 22 Sept., 2013.

Distribution in India: Karnataka, Andhra Pradesh and Gujarat (Source: Borse *et al*. 2017) [4].

Remarks: The descriptions and measurements of conidia are agreed with that of *D. erecta* Ingold (1943a) [11]. Hence, it is assigned to that species. It is being reported for the first time from Maharashtra.

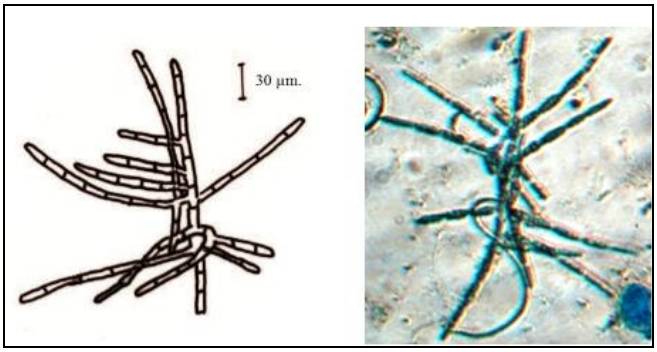

Fig 8

Acknowledgement-
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