



## Some new records of lower aquatic fungi from western Maharashtra, Maharashtra State, India.

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**Abstract:** Present study deals with the study of some lower aquatic fungi different regions of Maharashtra viz., *Acaulopage dichotoma* Drechsler belong to family Zoophagaceae (Class- Zygomycetes) while *Achlya oblongata* de Bary, *Brevilegnia megasperma* Harvey, *Saprolegnia ferax* (Gruih) Thuret and *Saprolegnia subterranea* (Dissman) Seymour belongs to family Saprolegniaceae (Class - Oomycetes). All these are new records of aquatic fungi from the Maharashtra state.

**Key words:** Oomycetes, Zygomycetes, lower aquatic fungi, *Saprolegnia*.

### Introduction

Fungi and fungus-like organisms mineralize chitin, thus contributing to the purification of the aquatic environment (Czeczuga & Godlewska 2001). The study of aquatic fungi has been carried out in all over the world by Coker (1923), Dick (1990), Johnson (1956), Middleton (1943), Seymour (1970), and Robertson (1980). In India, Butler (1907) first report occurrence on the phycomycetes. Later on a large number of investigators have reported different species of this group, Bhargava (1946), Dayal and Thakurji (1968), Khulbe (1977), Mer (1980), Chowdhry and Agarwal (1980), Manoharachary (1981,1991), Mer and Khulbe (1984), Mishra and Dwivedi (1987), Prabhujji and Shrivastava (1978), Sati (1997), Prasad Dei *et al.*, (2009) and Shinde and Pawar (2015) etc. A wide variety of aquatic fungi such as *Zoophagales*, *Saprolegniales* and *Peronosporales* are found in fresh water. Till 1942, available information was mainly concerned to "oosporic phycomycetes" or "water molds" which till then were regarded as true water fungal flora.

Baiting techniques have provided a wealth of information on isolation and distribution of aquatic fungi. The main purpose of the study was to determine species composition of aquatic fungi growing on the insect, aquatic plants and seed baits.

### Materials and Methods

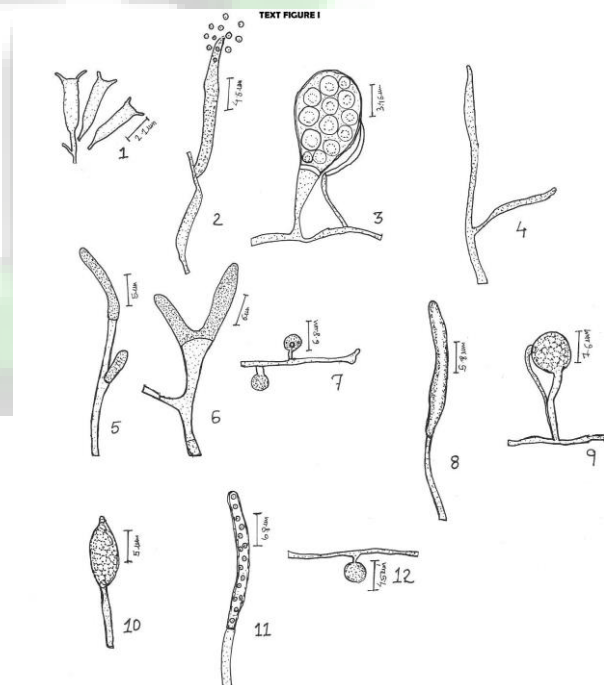
Frequent visits were made fortnightly, to different water bodies in and around Satara (M.S.) during different seasons, viz. Krishna river, Kas lake, Pateghar etc. during 2009-2015. Water temperature 15.6 to 27.6°C at the surface and from 15.1 to 26.5°C at 20m depth was preferred. Foam, submerged aquatic plants and litter samples were collected in sterile polythene bags and plastic jars respectively. Various baits such as autoclaved insects viz. cockroaches, ants, boiled bean seeds, autoclaved wood pieces etc. (Khulbe, R. D. 1985).

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For recovery of aquatic phycomycetes. Petri plates were left at room temperature (at  $20\pm 2^\circ\text{C}$ ) to allow fungal colonization. The baits were observed under a light microscope (100x) every day, starting from the third day of the culture growth. Several microscopic preparations were made from each sample. At the same time, the respective developmental stages of fungi were measured using an ocular micrometer. (Shinde and Pawar 2008) The identification of fungi was based on purely morphological features. Recent literature was consulted for the identification of these fungi Khulbe (2001).



#### Description

*Acaulopage dichotoma* Drechsler

*Mycologia* 37: 1-31, 1945.

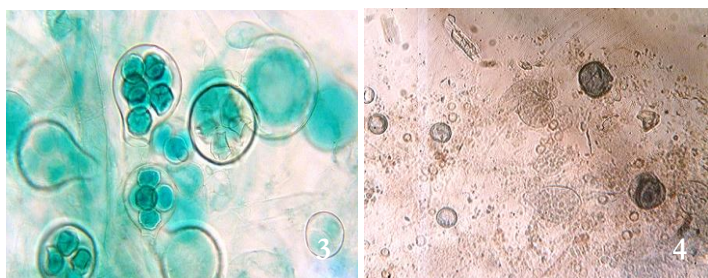
Plate Figure No.: 1-2 Text Figure No.:1



*Acaulopage dichotoma* Drechsler

**Figure 1:** Single conidium

**Figure 2:** Several conidia afloat on water surface



*Achlya oblongata* de Bary

**Figure 3:** Apical oblong oogonium with many subcentric oospores and diclinous antheridia

**Figure 4:** oblong oogonia with many subcentric oospores

Hyphae, branched, hyaline 1.3-1.6 $\mu$ m wide; Conidia unbranched and clavate during early development, but became distally bifurcate, with the arms of the dichotomy having an angle of 90° to one another, the primary bifurcation was often followed by a secondary bifurcation of one or both arms. Each arm tapered distally and formed a tubular extension, 5-20 $\mu$ m long, most of which became empty of cytoplasm as the conidium matured. Mature conidia, excluding the arms, 25-60 $\mu$ m X 6-15 $\mu$ m. Zygospores cannot be seen.

**Habitat:** Collected from foam samples from Kas lake of Satara (M. S.), 29<sup>th</sup> June 2012. Leg. V. S. Shinde and deposited in M. H. B.D. Y. C. I. S. Satara No. 36.

**Remark:** Sati, Tiwari and Belwal (2003) collected from decaying leaves from Nainital. The present collections have been found to be matched well in all respects with *Acaulopage dichotoma* Drechsler in respect to its morphology and dimensions of hyphae and conidia and therefore, referred to it and recorded for the first from aquatic bodies from Maharashtra.

*Achlya oblongata* de Bary

*Sylloge Fungorum* IX: 346, 1891.

Plate **Figure** No.: 3-4 Text **Figure** No.:2-3

Colony stout, whitish; Mycelium branched, hyaline; sporangia abundant, fusiform 180 - 230 $\mu$ m X 25 - 33 $\mu$ m; zoospores discharge achlyoid, spores

clusters persistent 6-12 $\mu$ m; oogonia abundant borne laterally on main branches, oblong to subspherical, wall smooth, thin; antheridia not seen. Oospores 1-16 in number, subcentric 15-35 $\mu$ m, germination not observed.

**Habitat:** Collected on leaf litter from Kamatipura pond, Satara (M. S.), 28<sup>th</sup> Dec 2009. Leg. V. S. Shinde and deposited in M. H. B.D. Y. C. I. S. Satara No. 38

**Remark:** Hamid (1942) isolated from Lahore for first time from India. Later Rai and Mishra (1977b, 1981) collected from pond water of Lacchi Tara, Lucknow. Hasija and Khan (1983) collected from pond water of Deo Tal Lake, Jabalpur. Dayal and Thakurji (1968) isolated it from pond water near Tikari village, Varanasi. The present collections have been found to be matched well in all respects with *Achlya oblongata* de Bary in respect to its morphology and dimensions of colony, hyphae, sporangia, zoospores and oogonia and therefore, referred to it and recorded for the first from aquatic bodies from Maharashtra.

*Brevilegnia megasperma* Harvey

*J. Elisha Mitchell Sci. Soc.* 45: 322, 1930.

Plate **Figure** No.:5-6 Text **Figure** No.:4-7

Colony whitish, reaching a ring growth; mycelium dense, hyaline, of 10 - 15 $\mu$ m; hyphae thick, branched 30-60 $\mu$ m; zoosporangia terminal on main hyphae, clavate, filamentous, 20 -280 $\mu$ m X 15 -38 $\mu$ m, secondary sporangia formed at the tip of hyphal branches; spores broad, spherical, formed in single or many rows, 8-12 $\mu$ m; gemmae abundant, dark, dense; oogonia abundant spherical, 22-60 $\mu$ m in diameter; antheridia not observed. Not cultured on media.



*Brevilegnia megasperma* Harvey

**Figure 5:** Hyphal tip

**Figure 6:** Mature Gemmae

**Habitat:** Collected on aquatic plant *Hygrophila corymbosa* Lindau. (Syn.-*Nomaphila stricta* (Vahl) Nees) [Fam. - Acanthaceae] from Pawana river, Pune (M. S.), 1<sup>st</sup> Jan 2012. Leg. V. S. Shinde and deposited in M. H. B.D. Y. C. I. S. Satara No. 37.

**Remark:** Khulbe, R.D. (1983) isolated this species on hemp seeds from Nainital. The present

collections have been found to be matched well in all respects with *Brevilegnia megasperma* Harvey in respect to its morphology and dimensions of colony, mycelium, zoosporangia, zoospores, gemmae and oogonia and therefore, referred to it and recorded for the first time from aquatic bodies from Maharashtra.

***Saprolegnia ferax*** (Gruith) Thuret

*Ann. Sci. Nat. Bot.* III, 14: 214, 1850.

Plate **Figure** No.:7-9 Text **Figure** No.:8-10

Colony cottony, whitish; hyphae moderately stout, branched; zoosporangia abundant, cylindrical or filamentous sometimes tapering, 80 – 450µm X 15 -35 µm; encysted zoospores 9-12 µm in diameter, gemmae few, spherical, pyriform, cylindrical, irregular, terminal intercalary; oogonia abundant, spherical and cylindrical, 30-168µm; oospores spherical, 12-28µm in diameter



***Saprolegnia ferax*** (Gruith.) Thuret

**Figure 7:** Mature oogonium with centric oospores and monoclinous branch of antheridium

**Figure 8 & 9:** Different types of oogonia.

**Habitat:** Collected from roots of aquatic plant from Kas lake Satara (M. S.), 29<sup>th</sup> June 2012. Leg. V. S. Shinde and deposited in M. H. B.D. Y. C. I. S. Satara No. 34.

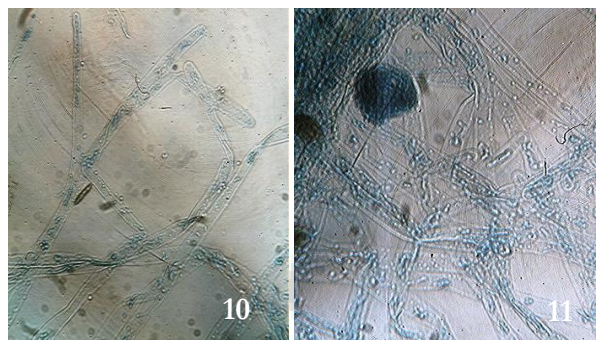
**Remark:** Bhattacharya and Baruah (1953), on *Labeo rohita* F. Hamilton from Assam; Dayal and Tondon (1962), isolated on hemp seeds from ponds of Allahabad; Srivastava (1967a) were reported from different places from Gorakhpur; Dayal and Thakurji (1966 and 1968) from temporary, permanent and cemented ponds of Varanasi; Chowdhry and Agrawal (1980a & b) from soil and water samples from New Delhi; Misra (1982) from alkaline ponds of Lucknow; while Phrabhuji (1984) isolated from soils of Gorakhpur; Gupta and Mehrotra (1988a) from soils of Brahma and Sanhit Sarovar. Khulbe (1985 & 1991) collected from water samples from Nainital. Khare (1992) isolated it from all rivers, pond and lakes of Bareilly. The present collections have been found to be matched well in all respects with *Saprolegnia ferax* (Gruith) Thuret in respect to its morphology and dimensions of colony, hyphae, zoosporangia, zoospores, gemmae, oogonia and

oospores and therefore, referred to it and recorded for the first from aquatic bodies from Maharashtra.

***S. subterranae*** (Dissman) Seymour

*Nova Hedwigia* 19: 59-62, 1970.

Plate **Figure** No.:10-11 Text **Figure** No.:11-12



***S. subterranae*** (Dissman) Seymour

**Figure 10:** Mature zoosporangia showing liberation of zoospore

**Figure 11:** An empty zoosporangium

Hyphae slender, aseptate, branched 12 – 18 µm in diameter; primary zoosporangia abundant, cylindrical, rarely clavate, 165 – 450 µm X 25 – 35 µm; zoospores 7.4-9µm in diameter, gemmae abundant variable in shape and size; oogonia abundant spherical, 28-32µm in diameter; oospores spherical, single in oogonia 20-30µm.

**Habitat:** Collected from roots of aquatic plant from Kas lake Satara (M. S.), 29<sup>th</sup> June 2012. Leg. V. S. Shinde and deposited in M. H. B.D. Y. C. I. S. Satara No. 35.

**Remark:** Mer and Khulbe (1984) isolated from Ram Tal soils. Later Khulbe (1985) was reported from soil samples of Nainital Forest. Khare (1992) isolated this species from water samples from Bareilly. The present collections have been found to be matched well in all respects with *Saprolegnia subterranae* (Dissman) Seymour in respect to its morphology and dimensions of hyphae, zoosporangia, zoospores, oogonia and oospores and therefore, referred to it and recorded for the first from aquatic bodies from Maharashtra.

## Results and Conclusion

In the present investigation 5 aquatic fungal species were found to grow on baits viz. cockroaches, seeds, aquatic plants and roots of aquatic plants. *Acanlopape dichotoma* Drechsler collected from foam samples from Kas Lake. While, *Achlya oblongata* de Bary, *Brevilegnia megasperma* Harvey, *Saprolegnia ferax* (Gruith) Thuret and *Saprolegnia subterranae* (Dissman) Seymour belongs to order Saprolegniales. They have been never before encountered in Satara waters. All species are new records to fungi of Maharashtra.

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