iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** III **Month of publication:** March 2018

DOI: http://doi.org/10.22214/ijraset.2018.3633

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue III, March 2018- Available at www.ijraset.com

First Report of Peritrich Ciliates of Genera Pseudovorticella from the Ayiramthengu Mangrove Ecosystem, Southwest Coast of India

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Abstract: ***Twelve peritrich ciliates, Pseudovorticella banatica, P. clampi, P. dingi, P. fossneri, P. jaerae, P. jankowskii, P. mollis, P. monilata, , P. pseudocampanula, P. quadrata , P.sinensis, P. stilleri were reported for the first time from the Ayiramthengu mangrove ecosystem of Kerala, southwest coast of India. Their morphology and silver line system were described using live observation and silver impregnation. The study revealed that all the species were found to be new records from India.***
Keywords: Mangrove, Ciliate, Silver line system, Pseudovorticella, prop root

I. INTRODUCTION

The subclass Peritrichia is one the largest and taxonomically diverse group of ciliates, containing over 1000 nominal species (Kahl,1933, 1935; Kent, 1880-1882; Song, 1986, 1991; Stiller, 1971). The genus Pseudovorticella was established by Foissner and Schiffmann (1974) to include those peritrichs which are morphologically similar to Vorticella species but had a reticulate pattern of silver line system with a line running vertically as well as horizontally. Silver line system is particularly useful for species diagnosis in Pseudovorticella, and biometric analyses have been carried out on several species (Foissner and Schiffmann, 1974 and 1975; Foissner, 1979). Morphological features traditionally used in vorticellid taxonomy are also useful diagnostic characters of species of Pseudovorticella and these include the size and shape of the zooid, number and position of contractile vacuoles and shape and position of the macronucleus (Noland and Finley, 1931; Foissner, 1979; Warren, 1986). Among peritrich ciliates, Pseudovorticella became one of the most difficult challenges in taxonomy because of the following reasons (1) Pseudovorticella has a relatively small number of species compared with Vorticella species and receives little attention in taxonomy despite its wide distribution; (2) Pseudovorticella species are very similar in vivo and the known species are insufficiently described; (3) Pseudovorticella species are quite similar to Vorticella species in living morphology, however, the taxonomic status of many Vorticella species themselves is highly doubtful because of a lack of silver staining data. (Clamp 2005, 2006; Foissner 1979; Foissner et al, 1992; Kahl 1933, 1935; Kent, 1880–1882; Noland and Finley, 1931; Stiller, 1971; Wang *et al*, 2012; Warren, 1986, 1987).

II. MATERIAL AND METHODS

Samples were collected from the Ayiramthengu mangrove situated (lat. $9^0\,6^1$ to $9^0\,8^1$ N long.$76^0\,28^1$ to $76^0\,29^1$ E) in Kollam district of Kerala, a part of Kayamkulam estuary, which is the narrow stretch of tropical backwater on the southwest coast of India (Fig. 1). Mangrove prop roots and litter were covered and attached by epibionts films and samples were taken by scraping 1 cm^2 patch of the moist film into sterile 15 ml collecting tubes containing 3% formalin. Living ciliates were observed using bright field microscopy. For proper identification of epibionts, they were isolated and treated using the silver carbonate technique of Fernandez and Castro de (1986). The systematic scheme proposed by Lynn (2008) was followed.

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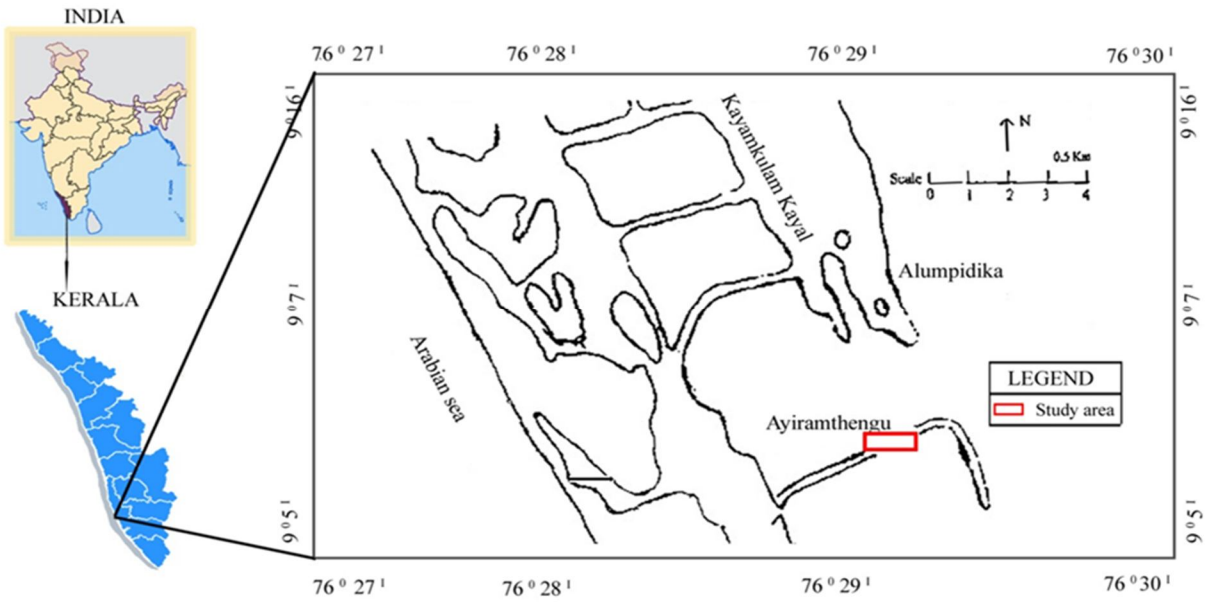

Fig. 1. Map of Ayiramthengu mangrove ecosystem

III. RESULT

A. *Systematics*

The taxonomic position of the genus *Vorticella* is given as follows:

Subkingdom: Protozoa Goldfuss, 1818 emend. Siebold Von, 1848
Phylum: Ciliophora Doflein, 1901
Class: Oligohymenophora de Puytorac et al., 1974
Subclass: Peritrichia Stein, 1859
Order: Peritrichida Stein, 1859
Sub order: Sessilina Kahl, 1933
Family: Vorticellidae Ehrenberg, 1838
Genus: pseudovorticella Foissner and Schiffmann, 1974
Pseudovorticella banatica Sun et al., 2009

Description: Zooid approximately spherical, 65-72 x 58-63 µm in vivo. Peristomial lip relatively thin, single layered. Macronucleus J- shaped. Single contractive vacuole located near ventral wall of infundibulum. Pellicle smooth, with conspicuously reticulate striations.

B. *Pseudovorticella clampi, Ji et al., 2005*

Description: Zooid elongated bell shaped, 85x65 µm in vivo. Single layered peristomial lip. Macronucleus J- shaped. Single contractile vacuole located near ventral wall of infundibulum. Pellicke with densely- arranged greyish granules.

C. *Pseudovorticella dingi*

Description: Cell inverted bell-shaped, measuring about 33–38 µm in vivo. One apically locate contractile vacuole. Macronucleus J-shaped. Pellicle with granules. Peristomial lip relatively thin, well extended and body not constricted beneath it. Peristomial disk flat and moderately elevated when cell fully extended. Stalk approximately 130–170 µm long, 3 µm in diameter and surface of stalk usually smooth.

D. *Pseudovorticella fossneri* sun et al; 2007

Description: Zooid conspicuously flattened 22-32 × 41-52 µm in vivo. Peristomial lip tin and single layered. Macronucleus j shaped. To contractile vacuoles situated near ventral all of infundibulum .pellicle with inconspicuous pellicular blisters which is recognizable only under high magnification.

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E. Pseudovorticella jaerae Precht, 1935

Description: Zooids inverted bell-shaped 42-58 x 27-48 µm in vivo. Peristomial lip single layered, relatively thick. Macronucleus J-shaped. Single contractile vacuole located near the ventral wall of the infundibulum. Pellicle with a thin layer of greyish pellicular blisters.

F. Pseudovorticella jankowskii Sun et al 2009

Description: Zooids almost invariable in shape, inverted bell-shaped. Peristomial disc moderately elevated above the peristome. Peristomial lip rather than thin, only 2-4 µm thick, smooth, extending well beyond the zooid margin. Two contractile vacuoles located near the ventral wall of the infundibulum. Macronucleus with its peristomial end lying across the peristome. Pellicle appears smooth at low magnifications.

G. Pseudovorticella Mollis Stokes, 1887

Description: Zooid inverted bell-shaped 38-43 µm long 23µm wide; peristomial lip 42µm in diameter; infundibulum reaches one third body length; two contractile vacuoles situated in the anterior part of zooid; stalk60-80 length.

H. Pseudovorticella monilata Tatem, 1870

Description : Zooid inverted bell-shaped, 43-72µmlong 40-46µm wide; peristomial lip 52 µm in diameter ; infundibulum reaches half body length; two contractile vacuoles situated in the anterior part of zooid; macronucleus j shaped; stalk 70-90µm length.

I. Pseudovorticella pseudocampanula Foissner, 1979

Description: Zooid inverted bell-shaped, 36-48 x 20-22 µm in vivo. Peristomial lip 34 µm in diameter. Peristomial lip becomes puckered in some time. Infundibulum reaches half body length, contractile vacuole situated close to infundibulum, macronucleus J shaped. Thecoplasmic granules present on spasmoneme.

IV. DISCUSSION

Vorticella and pseudovorticella are the most successful symbionts of the class oligohymenphorea coming under the phylum Ciliophora. Peritrichous ciliates contain many stalk-possessing groups that are found in both marine and freshwater habitat Foissner et al, 1992. Because of the presence of identical morphological features many known forms, especially in species rich genera such as Zoothamnium, vorticella and Pseudovorticella are difficult to differentiate each other Kahl, 1933, Kusters,1974. Live observation and, silver staining methods facilitate the species level differentiation of twelve peritrich ciliates, and it to be the first ever report from India.

V. CONCLUSION

In India 2577 species of Protozoa have been reported so far constituting about 8 percent of the total world protozoan population. However, most of the species under the class Oligohymenophora was untouched by many Indian authors. This study analyzes the species composition of class Oligohymenophora with a special reference to Pseudovorticella. Moreover, the study represents the pioneer attempt to analyses the species composition of class Oligohymenophora and further studies are needed to confirm the interdependence among organisms.

VI. ACKNOWLEDGEMENTS

The authors are thankful to Principal, Catholicate College, Pathanamthitta for the facilities provided.

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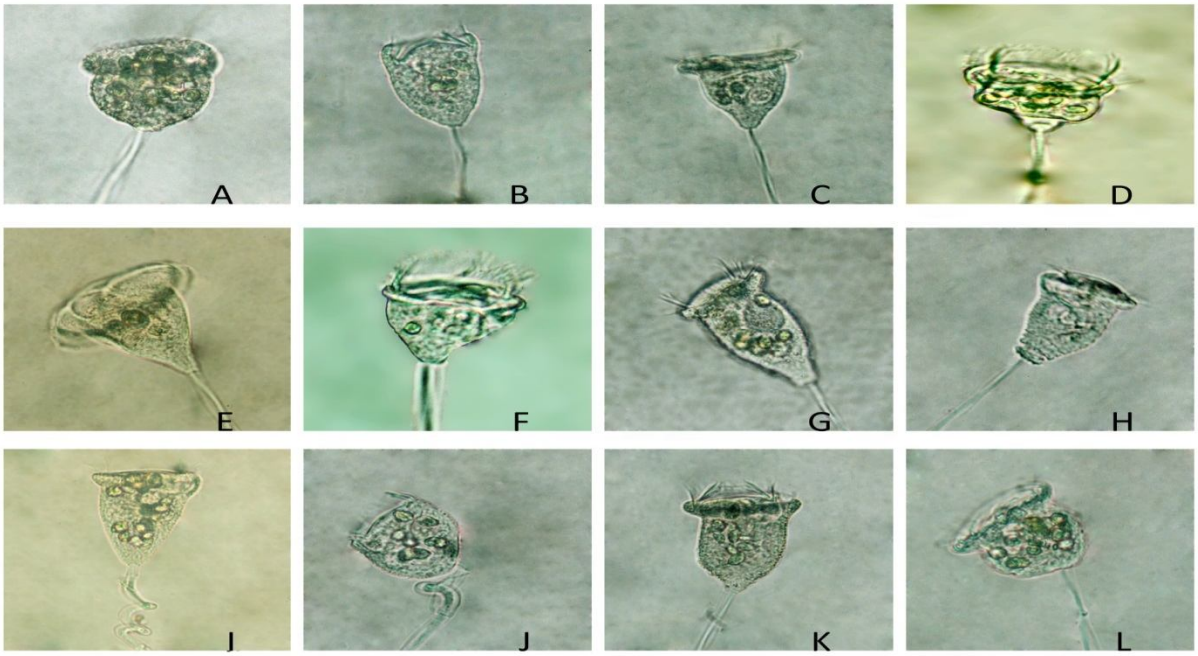

Fig. 2. A-L. Photomicrographs of species identified. A. Pseudovorticella banatica Sun et al., 2009, B. Pseudovorticella clampi, Ji et al., 2005, C. Pseudovorticella dingi, D. Pseudovorticella fossneri sun et al; 2007, E. Pseudovorticella jaerae Precht, 1935, F. Pseudovorticella jankowskii Sun et al 2009, G. Pseudovorticella mollis Stokes, 1887, H. Pseudovorticella monilata Tatem, 1870, I. Pseudovorticella pseudocampanula Foissner, 1979, J. Pseudovorticella quadrata Foissner, 1979, K. Pseudovorticella sinensis ji et al, 2003, L. Pseudovorticella stilleri Stiller, 1963

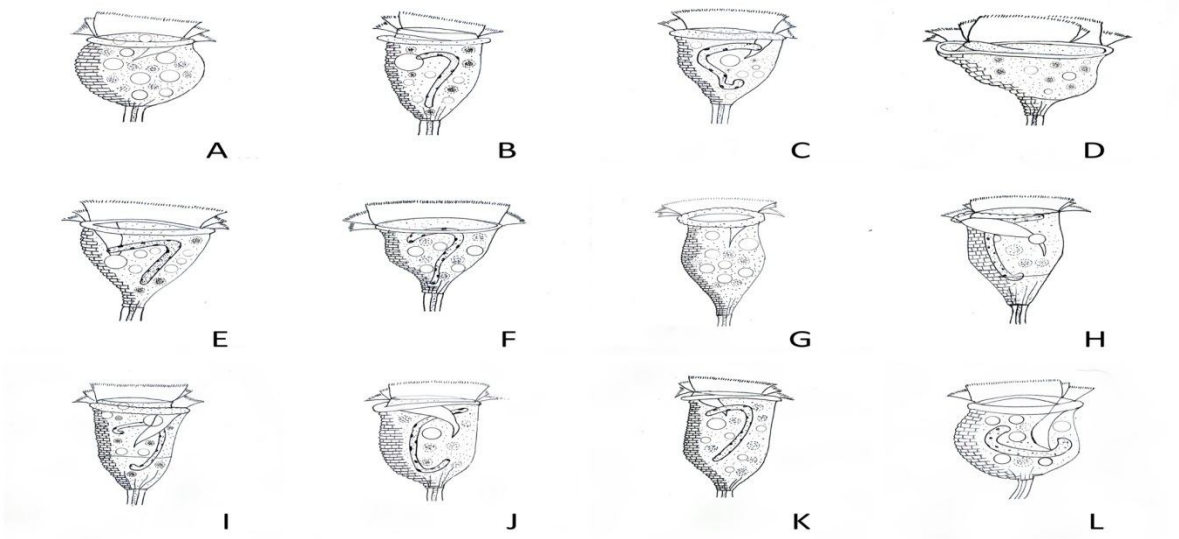

Fig. 3. A-L. diagrammatic sketch of species identified. A. Pseudovorticella banatica Sun et al., 2009, B. Pseudovorticella clampi, Ji et al., 2005, C. Pseudovorticella dingi, D. Pseudovorticella fossneri sun et al; 2007, E. Pseudovorticella jaerae Precht, 1935, F. Pseudovorticella jankowskii Sun et al 2009, G. Pseudovorticella mollis Stokes, 1887, H. Pseudovorticella monilata Tatem, 1870, I. Pseudovorticella pseudocampanula Foissner, 1979, J. Pseudovorticella quadrata Foissner, 1979, K. Pseudovorticella sinensis ji et al, 2003, L. Pseudovorticella stilleri Stiller, 1963

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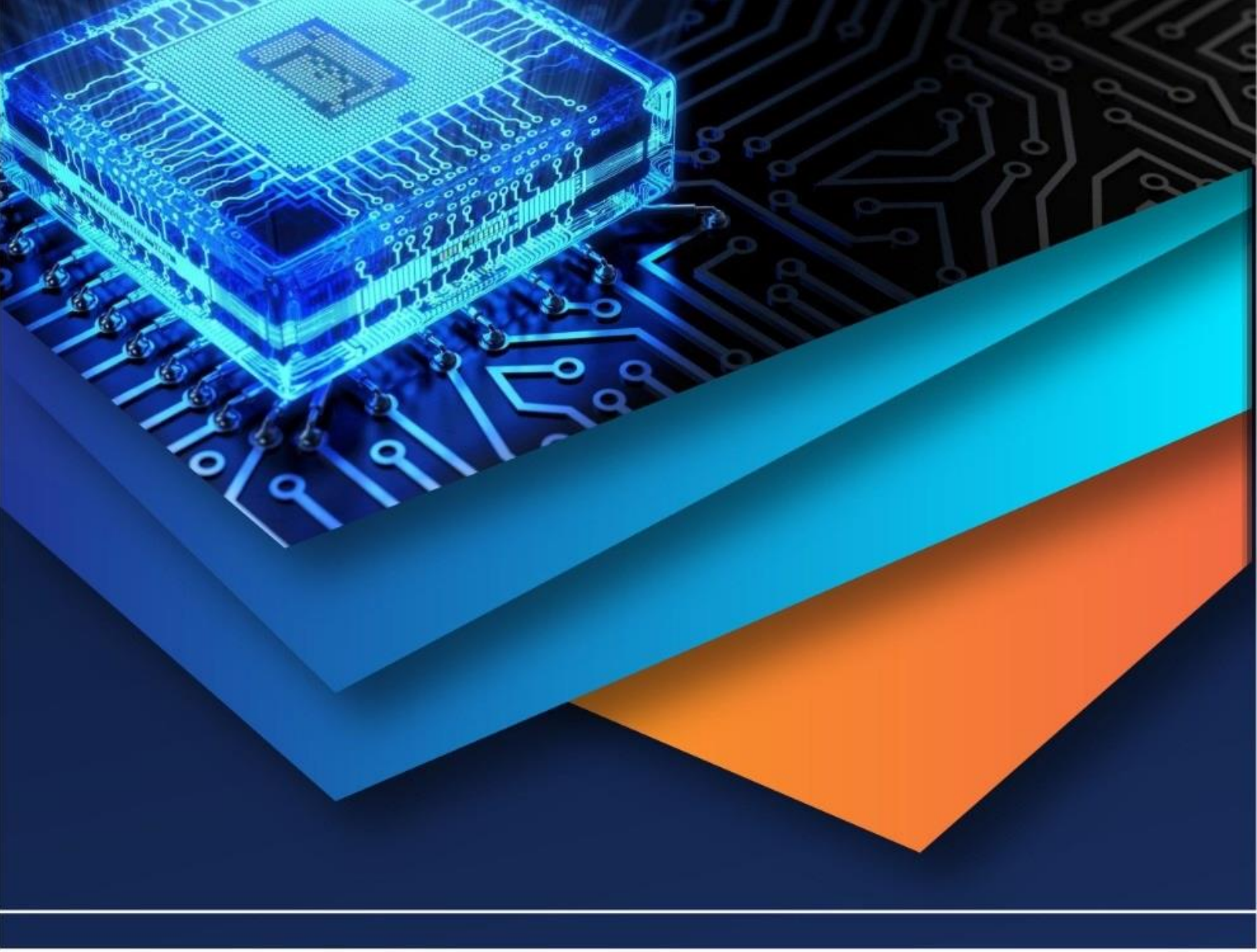

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