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A Preliminary Study on Biodiversity of Cyanobacteria of Agniar Estuary, Pudukkottai

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Abstract
In the present study, a total of 38 species belonging to 12 classes were recorded. Among the various classes*, Oscillatoriaceae* recorded maximum diversity by recording 10 species followed by *Phormidiaceae* recording five species and Nostocaceae by four species; while *Chrococeaceae, Merispropediaceae* and *Microcystaceae* recorded three species each, *Scytonemataceae* and *Pseudoanabaenaceae* were represented by two species and classes *Dermocarpaceae*, *Synechoccaceae* and *Xenococcaceae* were represented only by one species each. A familywise comparison reveals that *Phormidiaceae* and *Sycotomateaceae* preferred February to record their highest counts, while *Dermococcaceae* preferred May and Merispopediaceae recorded the maximal counts in June. However, Synechoccaceae registered their maxima in July while Nostococcaeceae preferred July and August and Chrococcaceae recorded their maxima in October.

Keywords
Agniar estuary, Cyanobacteria, biodiversity, Tamil Nadu

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INTRODUCTION
Estuaries are unstable ecosystems generally having a limited number of organisms (Selvam *et al.*, 2013). However, they support a high abundance of organisms due to their high productivity. They are one of the richest and most productive areas of organic detritus and form the base of the food chain. However, the hydrodynamic conditions in an estuary are quite complex as they are influenced by river flow, tide, wind and density factors. Further, they are modified due to earth rotation, bottom friction and the geometric properties of the estuarine system (Srilatha *et al.*, 2012).

Due to the unique feature of salinity in the estuaries, both freshwater and marine ecosystems can be encountered here. However, the different conditions present in these systems also result in high mortality of the eggs and larvae of the organisms living in these habitats. Estuaries being unique environments harbour diverse groups of microorganisms due to high amount of biodegradation of organic matter. Hence, various groups of bacteria and fungi such as nitrogen fixers, phosphate solubilizers, cellulose decomposers etc. are prevalent in this system (Holguin *et al.*, 2001). These organisms support these systems in many ways; on the one hand, they help in biogeochemical cycling of the nutrients in the system and on the other hand act as an important source of food for a variety of organisms besides maintaining its positive nature.

In India, the brackish water available has been estimated to be around 12 million hectares (Heran *et al.*, 1992) of which about 65,000 ha are under aquaculture. Tamil Nadu has a brackish water spread of about 63000 ha. A hydrobiological study is a prerequisite to the assessment of the potentialities, distribution of flora and fauna and also to understand its realities between the different tropic levels and food webs. It is in this context the present study was attempted to assess the cyanobacterial diversity of Agniar Estuary system in Pudukkottai District, Tamil Nadu, India.

MATERIALS AND METHODS

Study Area

The Agniar estuary is situated in the Palk Strait on the East-coast of India (Latitude 10° 20′ N; and Longitude 79° 23′ E). It is a true estuary and the exchange of water occurs between the estuarine and the adjoining neritic realm of the Bay of Bengal throughout the year. The river mouth is open throughout the year. It is highly productive and rich in fish, prawns, hermit crabs, crabs clams and oysters.

Cyanobacterial Analysis

Surface water samples were collected with the help of a satin net (pore diameter 4.5 μ) fitted to an aluminium frame between 7:00 and 8:00 am for a period of two years (June 2016 to December 2018). Collection was done on a monthly basis for both the water bodies. The samples were immediately transferred to glass containers for later microscopic analyses. Lugol's solution was also added as a preservative. Care was also taken to observe some fresh samples. The counting of cyanobacteria was done using a Sedgwick-Rafter Counting Cell (Saxena, 1987). Samples were isolated and identified by standard manuals (Desikachary, 1959; Starmach, 1966; Pennak, 1978; Adoni, 1985; Trivedy *et al.*, 1987; Sridharan, 1989). While cyanobacterial population was estimated by drop method as described by Pearsall *et al.* (1946), further counting and identification of cyanobacteria were done by following Pennak (1978), Adoni (1985) and Trivedy *et al.* (1987). In addition, diversity indices were also calculated following Trivedy *et al.* (1987). Finally, the results obtained in the present study were statistically treated for a meaningful discussion.

RESULTS AND DISCUSSION

In the present study a total of 38 species belonging to 12 classes were recorded. Among the various classes, Oscillatoriaceae recorded maximum diversity by recording 10 species followed by Phormidiaceae recording five species and *Nosto*caceae by four species; while Chrococeaceae, Merispropediaceae and Microcystaceae recorded three species each, Scytonemataceae and Pseudoanabaenaceae were represented by two species and classes Dermocarpaceae, Synechoccaceae and Xenococcaceae were represented only by one species each.

Chrococcaceae recorded only one perennial species (*Chrococcus turgidus*) while the others were seasonal. As a group, they preferred October to record their highest count and was dominated by *C. turgidus*.

Oscillatoriaceae was represented by 10 species belonging to three genera. While the genus *Oscillatoria* was represented by 4 species of which two were perennial (*O. salina* and *O. tenus*) with *O. salina* dominating in terms of count. The genus *Lyngbya* was represented by 3 species of which only *L. major* was perennial. The genus *Plectonema* was also represented by 3 species of which only *P. stagnina* was perennial. Among the various species in this group *L. major* was the most dominant organism in terms of number closely followed by *O. salina.*

The class Phormidiaceae was represented by 5 species belonging to two genera, while the genus *Phormidium* was represented by 4 species of which only *P. tenne* was perennial, the genus *Trichodesmium* was represented by a single perennial species *T. erythraeum.* Within this group *P. tenue* was the most dominant species. As a group, the most preferred month was February when they recorded their highest count.

Nostocaceae was represented by 4 species belonging to the genus *Anabaena* of which only *A. variabilis* was perennial and was also the dominating species in terms of count. As a group, they recorded their highest count in July and August.

Merismopediaceae recorded 3 species belonging to 3 genera of which only *Synechocystis salina* was perennial and dominated in terms of count. As a group they recorded their highest counts in January. Microcysteaceae also recorded 3 species belonging to 2 genera of which only *Microcystis aeruginosa* was perennial and dominated over others in terms of number. As a group, they recorded their highest count in September. Rivuleraceae was also represented by 3 species belonging to two genera of which only *Dicothrix bauriana* was perennial. As a group they recorded their preference in June by recording the highest count.

Scytonemataceae was represented by two species belonging to the genus *Scytonema* of which only *S. varium* was perennial. As a group, they recorded the highest count in June. Pseudoanabaeneaceae was also represented by two species belonging to the genus *Spirulina* of which only *S. major* was perennial and was also the dominant species. As a group, they recorded the highest count in February.

The classes Dermocarpaceae, Synechoccaceae and Xenococaceae were all represented by a single species. While Dermocarpaceae recorded its highest count in May, Synechoccaceae recorded its peak in July and Xenococcaceae registered its peak in July.

A perusal of literature reveals that marine Cyanobacteria constitute an integral and major component of the microbiota in all estuarine systems (Potts, 1979; Hussain and Khoja, 1993; Kathiresan and Bingham, 2001; Palaniselvam and Kathiresan, 2002; Sakthivel, 2004; Silambarasan *et al.*, 2012). Silambarasan *et al.* (2012) also suggested that they occupy a wide range of illuminated ecological niches in terrestrial, marine and freshwater environments. Further many workers suggested that many marine forms grow along the shore as benthic vegetation between the high and low tide marks (Humm and Wicks, 1980; Palaniselvam, 1998; Kathiresan and Bingham, 2001) even though many of the species are truly marine (Nagarkar *et al.*, 2000). Thajuddin and Subramanian (1991, 1992) reported that 75% of the species recorded from the southern east coast of India have originally been reported in freshwater also (Smith, 1950; Desikachary, 1959; Humm and Wicks, 1980; Silambarasan *et al.*, 2012). In addition, Kawabata *et al.* (1993) also suggested that pelagic algal communities make important contributions to the smooth functioning of estuarine system.

In the present study, eventhough Cyanobacteria as a group was recorded throughout the period of study, a family-wise comparison reveals that each family preferred to choose a certain period of time to record their highest count. Thus, while Phormidiaceae and Sycotomateaceae preferred February to record their highest counts, Dermococcaceae preferred May and Merispopediaceae June to record their maximal counts. However, Synechoccaceae registered their maxima in July while Nostococcaeceae preferred July and August to record their maxima. On the other hand, Chrococcaceae recorded their maxima in October. Literature reveals that algal species show wide spectro-temporal variations due to the different effect of hydrographical factors on individual species (Gouda and Panigraphy, 1996). Many scientists also suggest that salinity plays an important factor in limiting the distribution of organisms as its variation in salinity caused by dilution and evaporation influences the flora of this region (Gibson, 1982; Balasubramanian and Kannan, 2005; Sridhar *et al.*, 2006; Saravanakumar *et al.*, 2008). A perusal of the correlation between Cyanobacteria and salinity reveals a strong positive correlation (Mugilan, 2017) indicating their relationship. According to Das and Panda (2010) total phosphate, nitrate and chloride contents also play as major role in the distribution of algae. Correlation between cyanobacteria and phosphate (Sivakami *et al.*, 2017), as well as nitrate (Mugilan, 2017) in the present study also reveals a positive relationship which reflects their influence on the growth and distribution of Cyanobacteria. Nevertheless, El-Gindy and Dorghan (1992) stated that algal growth depends on several environmental factors which are variable in different seasons and regions.

In the present study, a total of 38 species belonging to 12 classes were recorded. Among the various classes, Oscillatoriaceae recorded maximum diversity by recording 10 species followed by Phormidiaceae recording five species and *Nosto*caceae by four species; while Chrococeaceae, Merispropediaceae and Microcystaceae recorded three species each, Scytonemataceae and Pseudoanabaenaceae were represented by two species and classes Dermocarpaceae, Synechoccaceae and Xenococcaceae were represented only by one species each.

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REFERENCES

Adoni, A. D. (1985). *Work book on limnology*. Pratibha Publishers, Sagar, p. 1126.

Balasubramanian, R. and Kannan, L. (2005). Physico-chemical characteristics of the coral reef environs of the Gulf of Mannar Biosphere Reserve, India. *Int. J. Ecol. Environ. Sci.,* 31: 265-271.

Das, M. and Panda, T. (2010). Water quality and phytoplankton population in sewage fed river of Mahanadi, Orissa, India. *J. Life Sci.,* 2: 81-85.

Desikachary, T. V. (1959). *Cyanophyta*. Indian Council of Agricultural Research, New Delhi, p. 686.

El-Gindy, A. A. H. and Dorghan, M. M. (1992). Interrelation of phytoplankton, chlorophyll and physico-chemical factors in Arabian Gulf and Gulf of Oman during summer. *India J. Mar. Sci.*, 21: 257-261.

Gibson, R. N. (1982). Recent studies on the biology of intertidal fishes. *Oceanogt. Mar. Biol. Ann. Rev.*, 20: 363-414.

Gouda, R. and Panigrahy, R. C. (1996). Ecology of phytoplankton in coastal waters off Gopalpur, east coast of India. *Int. J. Mar. Sci.*, 2: 13-18.

Heran, M. P., Surendran, V., Madhusudhan, R. K. and Subba Rao, V. (1992). A success story on scientific shrimp farming. *Fishing clumes*. pp. 34.

Holguin, G., Vasquez, P. and Bashan, Y. (2001). The role of sediment microorganisms in the productivity, conservation and rehabilitation mangrove ecosystem: An overview. *Biol. Fertil. Soils*, 33: 265-278.

Humm, J. and Wicks, R. (1980). *Introduction and Guide to the Marine Blue-Green Algae.* Wiley Interscience Publication, New York. pp. 1-273.

Hussain, M. I. and Khoja, T. M. (1993). Intertidal and subtidal blue green algae, algal mats of open and mangrove areas in the Farasah Archipelago (Saudi Arabian) Red Sea. *Bot. Mar.,* 36: 377-388.

Kathiresan, K. and Bingham, B. L. (2001). Biology of mangroves and mangrove ecosystems. *Adv. Mar. Biol.*, 40: 81-251.

Kawabata, Z., Magendran, A., Palanichamy, S., Venugopalan, V. K. and Tatsukawa, R. (1993). Phytoplankton biomass and productivity of different size fractions in the Vellar estuarine system, southeast coast of India. *Indian J. Mar. Sci.*, 22: 294-296.

Mugilan, V. (2017). Biodiversity of microorganisms in two different freshwater ecosystems and their role in environmental pollution abatement. Ph.D. Thesis, Bharathidasan University, Tiruchirappalli, India.

Nagarkar, S., Subramanian, G. and Thajuddin, N. (2000). Marine cyanobacterial biodiversity from Andaman Islands, India. 4th Asia-Pacific Conference on Algal Biotechnology, University of Honk Kong, Honk Kong.

Palaniselvam, V. (1998). Epiphytic cyanobacteria of mangrove: Ecological, physiological and biochemical studies and their utility as biofertilizer and shrimp-feed. Ph.D. Thesis, Annamalai University, India.

Palaniselvam, V. and Kathiresan, K. (2002). Epiphytic Cyanobacteria from Mangroves. In: *Algological Research in India*. N. Anand (ed.), pp. 45-54.

Pearsall W.H. (1932) Phytoplankton in the English Lakes I. The composition of the phytoplankton in relation to the dissolved substances. Journal of Ecology, 20, 241– 262 Pennak (1978),

Pearsall, W. H., Gartiner, A. C. and Greenshields, F. (1946). *Freshwater biology and water supply in Britain.* Freshwater Biology Association of the British Empire Publ., 11: 1-90.

Pennak, R. W. (1978). Freshwater invertebrates of the United States. 2nd ed. John Wiley and Sons, New York. p. 803.

Potts, M. (1979). Nitrogen fixing (*Acetylene reduction*) associated with communities of heterocystous and non-heterocystous blue-green algae in mangrove forests of Sinai. *Oecologia*, 39: 359-373.

Sakthivel, K. (2004). Studies on marine cyanobacteria from mangrove environments. Ph.D. Thesis, Annamalai University, India.

Saravanakumar, A., Rajkumar, M., Thivakaran, G. A. and Serebiah, S. J. (2008). Abundance and seasonal variations of phytoplankton in the creek waters of western mangrove of Kachchh-Gujarat. *J. Environ. Biol*., 29: 271-274.

Saxena, D. (1987). *Soil water and waste water analysis*. New Delhi Publication. p. 283.

Selvam, J., Varadharajan, D., Babu, D. and Balasubramanian, T. (2013). Impact of physico-chemical parameters on fin fish eggs diversity from Muthupettai, South East Coast of India. *J. Environ. Anal. Toxicol.,* 3: 1-5.

Silambarasan, G., Ramanathan, T. and Kathiresan, K. (2012). Diversity of Marine Cyanobacteria from three mangrove environment in Tamil Nadu Coast, South East Coast of India. *Curr. Res. J. Biol. Sci.,* 4: 235-238.

Sivakami, R., Sirajunisha, V., Abdul Kader, K. and Prem Kishore, G. (2017). Experimental studies on biodegradation of domestyic waste using thermophilic fungi. *International Journal of Current Research.* 6: 4475-4478.

Smith, G. M. (1950). The Fresh Water Algae of United States - Cyanophyceae. Mc-Graw Hill Book Co., New York. pp. 539-604.

Sridhar, R., Thangaradjou, S., Senthil Kumar, S. and Kannan, L. (2006). Water quality and phytoplankton characteristics in the Palk Bay, south-east coast of India. *J. Environ. Biol.*, 27: 561-566.

Sridharan, V. T. (1989). Phytoplankton and algae studies. Techniques of plankton methodology. Prepared for Training workshop on Integrated Environmental Research programme on Kaveri River. pp.1-15.

Srilatha, G., Thilagavathi, B. and Varadharajan, D. (2012). Studies on physico-chemical status of Muthupettai mangrove, south-east coast of India. *Adv. Appl. Sci. Res.*, 3: 201-207.

Starmach, K. (1966). Cyanophyta - Since Galucophyta - Gluokofity. Flora Slodowokan Polsi, Tom 2. Warszawa, p. 800.

Thajuddin, N. and Subramanian, G. (1991). New Report of marine cyanobacteria from the southern east coast of India. *Phykos*, 30: 19-23.

Thajuddin, N. and Subramanian, G. (1992). Survey of Cyanobacterial flora of the Southern East Coast of India. *Botanica Marina*, 35: 305-311.

Trivedy, R. K., Goel, P.K. and Trisal, C. L. (1987). *Practical Methods in Ecology and Environmental Science.* Environmental publication, Karad.

Table-1: Diversity of Cyanobacteria of Agniar Estuary

No.	Species	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
I.	**Chroococcaceae**													
1.	*Chroococcus tenax*	2017	10	20	50	40	10	-	-	10	20	40	30	20
		2018	20	30	60	30	20	-	-	-	20	30	40	10
2.	*Chroococcus varius*	2017	-	-	-	-	-	20	30	40	10	-	-	-
		2018	-	-	-	-	-	-	60	20	10	-	-	-
3.	*Chroococcus turgidus*	2017	10	20	10	20	40	50	90	110	140	180	120	120
		2018	30	20	10	20	30	70	120	120	120	140	120	120
II.	**Dermocarpaceae**													
4.	*Dermocarpa leibleinea*	2017	-	-	10	30	60	40	-	-	-	-	-	-
		2018	-	-	10	20	50	30	-	-	-	-	-	-
III.	**Merismopediaceae**													
5.	*Aphanocapsa litoralis*	2017	-	-	30	70	60	40	10	-	-	-	-	-
		2018	-	-	20	80	30	30	20	-	-	-	-	-
6.	*Merismopedia aeruginea*	2017	-	-	-	-	-	10	20	-	-	-	10	20
		2018	-	-	-	-	10	20	10	-	-	-	10	20
7.	*Synechocystis salina*	2017	140	120	110	20	20	40	60	60	80	100	110	130
		2018	160	120	110	10	20	30	40	70	80	80	100	120
IV.	**Microcystaceae**													
8.	*Gloeocapsa aeruginosa*	2017	10	40	50	20	-	-	-	-	-	-	-	-
		2018	30	40	60	20	10	-	-	-	-	-	-	-
9.	*Microcystis litoralis*	2017	40	60	70	100	160	60	70	30	-	-	-	-
		2018	30	60	80	140	150	80	60	10	-	-	-	-
10.	*Microcystis aeruginosa*	2017	160	200	240	260	460	510	670	700	800	300	140	160
		2018	170	210	220	270	440	600	700	800	860	340	200	140

continued…

Table-1 continued…

No.	Parameters	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
V.	***Nostocaceae***													
11.	*Anabaena torulosa*	2017	-	-	-	-	-	10	60	30	-	-	-	-
		2018	-	-	-	-	-	20	60	80	30	-	-	-
12.	*Anabaena variabilis*	2017	110	100	70	60	20	30	40	50	60	90	140	120
		2018	120	90	50	20	30	20	30	60	70	100	160	140
13.	*Anabaena sphaerica*	2017	-	-	-	-	10	40	20	-	-	-	-	-
		2018	-	-	-	-	10	50	10	-	-	-	-	-
14.	*Anabaena iyengar*	2017	-	-	10	30	20	-	-	-	-	-	-	-
		2018	-	-	10	40	20	-	-	-	-	-	-	-
VI.	**Oscillatoriaceae**													
15.	*Oscillatoria cortiana*	2017	-	-	-	-	-	-	-	-	-	-	-	-
		2018	10	40	20	-	-	-	-	-	-	-	-	-
16.	*Oscillatoria salina*	2017	60	70	80	100	120	60	40	30	30	40	50	60
		2018	70	80	90	110	130	70	30	40	20	40	40	50
17.	*Oscillatoria tenuis*	2017	10	30	10	10	10	10	10	80	90	20	10	10
		2018	30	20	10	10	10	10	10	70	60	30	40	10
18.	*Oscillatoria formosa*	2017	20	20	10	-	-	-	-	-	-	-	-	-
		2018	20	30	10	-	-	-	-	-	-	-	-	-
19.	*Lyngbya major*	2017	80	90	110	120	70	80	70	60	40	70	80	90
		2018	70	90	120	140	80	90	30	30	50	80	90	100
20.	*Lyngbya majuscula*	2017	-	-	10	80	20	-	-	-	-	-	-	-
		2018	-	-	-	-	-	-	-	-	-	-	-	-
21.		2017	10	20	40	30	10	-	-	-	-	-	-	-

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No.	Parameters	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Lyngbya mesotricha	2018	10	40	60	30	20	-	-	-	-	-	-	-
22.	*Plectonema stagnina*	2017	30	40	60	70	80	90	110	30	30	40	20	20
		2018	40	50	40	60	90	100	90	40	30	40	30	30

continued…

Table-1 continued…

No.	Parameters	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
23.	*Plectonema terebrans*	2017	-	-	-	-	-	-	-	-	10	60	70	40
		2018	-	-	-	-	-	-	-	-	10	70	80	30
24.	*Plectonema putuale*	2017	40	70	30	20	-	-	-	-	-	-	-	-
		2018	40	30	20	20	-	-	-	-	-	-	-	-
VII.	**Phaomidiaceae**													
25.	*Phormidium ambiguum*	2017	20	20	20	10	10	-	-	-	20	40	10	10
		2018	30	40	10	10	10	-	-	-	10	30	20	20
26.	*Phormidium tenue*	2017	100	160	70	40	30	40	60	40	20	40	40	30
		2018	120	170	90	30	20	50	60	30	20	50	50	20
27.	*Phormidium fragile*	2017	-	-	-	-	-	-	-	-	-	30	40	60
		2018	-	-	-	-	-	-	-	-	20	40	60	70
28.	*Phormidium valderianum*	2017	10	40	20	10	-	-	-	-	-	-	-	-
		2018	10	40	10	10	-	-	-	-	-	-	-	-
29.	*Trichodesmium erythraeum*	2017	20	20	20	20	20	20	40	30	20	20	20	20
		2018	30	30	30	30	30	40	80	30	30	30	30	30
VIII.	**Pseudanabaenaceae**													
30.	*Spirulina subsalsa*	2017	80	90	100	120	140	30	-	-	40	80	30	70
		2018	70	80	160	200	160	40	-	-	30	60	20	40
31.	*Spirulina major*	2017	710	910	700	600	400	300	200	100	700	800	900	600
		2018	860	1020	800	600	600	400	300	200	600	800	960	800
IX.	**Rivulariaceae**													
32.	*Calothrix brevissima*	2017	-	-	-	-	60	70	60	30	-	-	-	-
		2018	-	-	-	-	40	80	60	30	-	-	-	-
33.	*Calothrix bharadwaja*	2017	-	-	-	-	-	-	-	-	10	40	20	-
		2018	-	-	-	-	-	-	-	-	-	-	-	-

continued…

Table-1 continued…

No.	Parameters	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
34.	*Dichothrix bauriana*	2017	170	140	120	110	110	110	110	110	110	140	160	180
		2018	180	130	130	120	120	120	120	120	120	160	170	190
X.	**Scytonemataceae**													
35.	*Scytonema chiastum*	2017	-	-	-	-	10	40	20	10	-	-	-	-
		2018	-	-	-	-	10	50	20	10	-	-	-	-
36.	*Scytonema varium*	2017	10	20	30	10	10	10	10	10	10	40	30	10
		2018	10	30	10	10	10	10	10	10	10	50	20	10
XI.	**Synechococcaceae**													
37.	*Synechococcus elongatus*	2017	140	140	140	150	160	130	130	130	130	140	160	130
		2018	150	140	140	160	170	140	140	130	130	140	140	140
XII.	**Xenococcaceae**													
38.	*Myxosarcina concinna*	2017	-	-	-	-	-	30	60	30	-	-	-	-
		2018	-	-	-	-	10	60	70	30	20	-	-	-

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Table-2: Total classwise count of Cyanobacteria of Agniar Estuary

No.	Family	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TOTAL														
I.	Chroococcaceae	2017	20	40	60	60	50	70	120	160	170	220	150	140
		2018	50	50	70	50	50	70	180	140	150	170	160	130
II.	Dermocarpaceae	2017	-	-	10	30	60	40	-	-	-	-	-	-
		2018	-	-	10	20	50	30	-	-	-	-	-	-
III.	Merismopediaceae	2017	140	120	140	90	80	90	90	60	80	100	120	150
		2018	160	120	130	90	60	80	70	70	80	80	110	140
IV.	Microcystaceae	2017	210	300	360	380	620	570	740	730	800	300	140	160
		2018	230	310	360	430	600	680	760	810	860	340	200	140
V.	*Nostoc*aceae	2017	110	100	80	90	50	80	120	80	60	90	140	120
		2018	120	90	90	60	60	90	100	140	100	100	100	140
VI.	Oscillatoriaceae	2017	250	340	350	430	310	240	230	200	200	230	230	220
		2018	290	380	370	370	330	270	160	180	170	260	280	220
VII.	Pharmidiaceae	2017	150	240	130	80	60	60	100	70	60	130	110	120
		2018	190	280	140	80	60	90	140	60	110	140	150	150
VIII.	Pseudanabaenaceae	2017	790	1000	800	720	540	300	200	100	740	880	930	70
		2018	930	1100	960	800	760	440	300	200	830	860	980	840
IX.	Rivulariaceae	2017	170	140	120	110	170	180	170	140	120	180	180	180
		2018	180	130	130	120	160	200	180	150	120	160	170	190
X.	Scytonemataceae	2017	10	20	30	10	20	50	30	20	10	40	30	10
		2018	10	30	10	10	20	60	30	20	10	50	20	10
XI.	Synechococcaceae	2017	140	140	140	150	160	130	130	130	130	140	160	130
		2018	150	140	140	160	170	140	140	130	130	140	140	140
XII.	Xenococcaceae	2017	-	-	-	-	-	30	60	30	-	-	-	-
		2018	-	-	-	-	10	60	70	30	20	-	-	-
Total Count		**2017**	**1990**	**2440**	**2940**	**2960**	**2110**	**1920**	**2100**	**1750**	**2390**	**2210**	**2190**	**1900**
		2018	**2310**	**2630**	**2410**	**2190**	**2330**	**2210**	**2130**	**1930**	**2580**	**2300**	**2370**	**2100**