IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

PRELIMINARY INVESTIGATION ON THE ALGAL FLORA OF ARABIAN SEA COAST AT KATTIL MEKKATHIL DEVI TEMPLE, CHAVARA, KOLLAM Dt., KERALA

Dr. Jithesh Krishnan R[1*], Karthika R[2]

[1*Assistant Professor, Post Graduate and Research Department of Botany, NSS College, Pandalam (affiliated to Kerala University), Kerala.

2 M.Sc. Student, Department of Botany, NSS College, Pandalam (affiliated to Kerala University), Kerala]

ABSTRACT

The present study deals with prevailing biodiversity of micro and macro algae of the coastal areas of Arabian Sea near Kerala Minerals and Metals Ltd. (KMML), Chavara, Kerala. The study mainly aimed at assessing the impacts of environmental changes and the marine ecology on flora of the Arabian Sea especially on algal population. Different study locations were fixed at the seacoast such as three sites for Lithophytic algae, benthic algae and periphytic algae (KM1, KM2 and KM3). In addition to these, General plankton was also identified. The study was carried out during January to March 2020. The air temperature of the area ranged between 33^0 C to 34^0 C, and the water temperature was between 31^0 C to 32^0 C. Highest number of Phytoplankton were observed at KM2 (18) and the lowest was at KM3 (14). Highest number of periphyton was observed at KM1 (9). The highest number of Benthic algae was observed at KM2 (7) and the lowest was at KM1 (3). More number of Lithophytic algae was observed at KM2 (10). About five species of planktonic algae were observed at KM1, three species each at KM2 and KM3. *Navicula*, *Nitzchia*, *Oedogonium* and *Tabularia* were the most prominent microalgae observed. The results from the present study indicate that the Arabian Sea coast is an important algal hotspot. As a hotspot of phytoplankton, greater numbers of algae were existing there; it needs to be investigated in detail to understand the influence of effluents discharging to the Sea near Kattil Mekkathil Coast.

KEYWORDS

Arabian sea coast, KMML, Phytoplankton, Benthic algae, Periphyton, Lithophyte, Plankton

INTRODUCTION

From the past few years, Kerala endorsed an unpredictable increase in the atmospheric temperature, paucity of water and similar drastic climatic changes. These are the warnings of an inevitable crisis that we are going to face in the near future. Development without vision and mindless consumerism has already led the environment of the State to an irrevocable degradation, especially the water resources of the State. A tropical State with average annual rainfall of 3100mm is now facing severe drought, unbearable heat and drastic climate changes rendering the life of people in peril (Gadgil, 2011).

A healthy ocean is important, especially along the coast, where millions live worldwide. The ocean contains coral reefs and mangroves, and these key ecosystem benefits hundreds of millions of people. Coral reefs cover just 2% of the earth's surface yet are home to 25% of all marine species on the planet, that are not yet explored completely. The Western Indian Ocean has the second largest coral hotspot in the world. Besides tourism and fisheries, coral species yield life saving medicines from the sponges and other organisms present in the sea. Unfortunately, corals are easily lost during coastal developments, destructive fishing, and bleaching events from extreme water temperatures **(**Smith et al., 2020**).**

Titanium Sponge Plant of India is located at Kerala Minerals and Metals Ltd (KMML), Chavara, Kollam District of Kerala. Titanium sponge plant is a manufacturing plant which produces titanium sponge, a material which has very useful applications in space programme and other strategic areas like aeronautics, light defense vehicles etc. The plant in India is the only one in the world, which can undertake all the different activities of manufacturing aerospace grade titanium sponge under one roof. The material is an alloy product, which is produced through *kroll process*, which includes leaching or heated vacuum distillation to make the metal almost 99.7% pure (Times of India, 2015).

Effluents from KMML, are polluting water resources, degrading the environment, and posing a public health hazard. The wastewater discharged by the company was found accumulating in the environment and polluting natural water bodies before reaching the Sea. The area to the north of the factory was filled with pools of brownish yellow, pungent smelling water, highly acidic and reactive (Lekshmi et al., 2012**)**. This is causing a serious threat to the marine flora and fauna, of which the micro algae are the most sensitive ones.

Hence, we decided to study the prevailing precious micro algae existing there, which were not studied yet. This detailed investigation enables a comprehensive and systematic analysis of the biological and ecological importance of the Arabian Sea coast at Kattil Mekkathil Devi Temple, near KMML, Chavara and its production potential. This enables to account the basic information on phytoplankton resources in the Arabian Sea. Analysis of the interpretation of the water quality parameters of the Arabian Sea in relation to

phytoplankton dynamics'. The baseline data generated would help planning and future policy decisions and in the better conservation and management of the coastal area, and the prevailing precious biological diversity and ecosystem dynamics of that area.

METHODOLOGY

For the convenient monitoring, systematic field study and regular sampling of waters, three sampling stations were fixed in the Arabian Sea coast. One sampling station is near the KMML industrial area, the second station is near the northern region of Kattil Mekkathil Devi temple and the third station is in between these two regions. These stations were fixed according to the effect of tides and considering the rate of pollution. These stations were designated as Kattil Mekkathil Devi temple stations -KM1, KM2 and KM3 respectively.

Water samples were collected from each station between 25/01/2020 and on 08/03/2020. All the samples for different laboratory analysis were packed in well insulated boxes, which are tightly sealed. The particular air temperature and water temperature of the field had measured using characteristic Mercuric Thermometer.

The samples for General Phytoplankton study were collected from surface water in 1L wide mouthed clean pre-labelled, pre-sterilized plastic bottles. The samples were packed without the disturbance of light and brought to the Laboratory for the identification process. For the study of periphyton, the phytoplankton colonized on some plants and macro algae seen along the shorelines were collected and dipped in 100ml distilled water. Algae of the sediments were collected from the mud using a 50 ml (2cm wide) syringe from the shores. Three representative samples were collected from each location (50 ml x 50 ml = 100ml). Algae on the rocky surfaces were collected using a scissor blade. Three representative samples were collected from each specific site. All the samples were fixed on the spot using Lugol' iodine (1ml: 10ml), immediately after collection (Trivedy and Goel, 1986). Further analysis were carried out in the laboratory.

Each of the 1-litre samples was allowed to concentrate the plankton organisms. Every one of these samples was made up to 50 ml after removing the surface water. Counting was made up by using a microscope with 45x magnification. The periphyton, benthos and lithophyte were counted by Lackey's drop method (Schwoerbell ,1972). The identification of phytoplankton was done using standard keys (Anand, 1998), (Santhanam et al, 1989). The microphotographs of each representative samples were taken using digital camera.

RESULTS AND DISCUSSION

The Air temperature ranged between 33^0c to 34^0c. The water temperature ranges between 31^0c to 32^0c. The Air temperature and water temperature at almost all the stations were the same. Algal density of KM1 was 1525/L, KM2, 1050/L and KM3 925/L respectively (Table-1).

Identified Phytoplankton

In order to find out the Species diversity, all the different Genera were counted and identified individually. Phytoplankton identified from the three stations of Arabian Sea coast, Kollam belongs to seven groups, the Chlorophyta, the Cyanophyta, the Rhodophyta, the Bacillariophyta, the Dinoflagellates, the Charophyta and Paheophyta. 16 phytoplankton were identified from KM1. 12 were identified up to species level and the remaining up to genus level only. From KM2, 18 phytoplankton were identified, 12 up to species level and the remaining up to genus level only. From KM3, 14 Plankton were identified, 8 were identified up to species level, remaining up to genus level only (Table-2).

In KM1, Chlorophyta with 4 species, Cyanophyta with 3 species and Bacillariophyta with 9 species were identified. Bacillariophyta were the major group. In KM2, Chlorophyta with 2 species, Cyanophyta with 2 species, Bacillariophyta with 13 species and Rhodophyta with only 2 species were identified. Bacillariophyta were the major group. In KM3 Chlorophyta with 2 species, single species of Charophyta, Cyanophyta with 4 species, Bacillariophyta with 6 species and Dinoflagellates with a single species were identified. In addition to the above-mentioned phytoplankton, a few macro algal species were also identified: *Caulerpa, Ulva intestinalis* and *Ulva latuca* belongs to Chlorophyta, *Spirogyra* sp. of Charophyta, *Sargassum* sp., *Turbinaria ornata* and *Turbinaria* sp. belongs to Phaeophyta and *Gracillaria* sp. of Rhodophyta were also identified (Table-3).

CONCLUSION

Oceans and seas are an important part of socio economic and biodiversity systems of each Country. They are the hotspots of rich biodiversity and rare species. Air temperature is one of the major climatic features assessed in the present study. Since changes in air temperature shows a close proportionality to that of water, which influence the diversity and density of phytoplankton and there by production potential of the water body. Temperature of the sea coast was comparatively higher.

Diversity of algae is an indication of water purity, and community structure is used to assess pollution. Chlorophyta, Cyanophyta and Bacillariophyta were present in all stations of Arabian Sea coast. Among the Chlorophyta identified from KM1, genus *Ulothrix* was the dominant one. The physical and chemical factors in the Arabian Sea promoted the diversity of Bacillariophyta, because it was the prime group. *Tabularia, Gomphonema, Navicula* and *Nitzchia* were the major genera. The presence of Cyanophycean algae is more important, because most of them can produce toxins. The major genera were *Microchaete.* It is well known that the combination of physical, chemical and biological factors determines the distribution of the diatom communities in the ocean.

The investigation generated important baseline data on the phytoplankton community structure of the Arabian Sea coast at Kattil Mekkethil area. It also reflected the increasing pollution in the area due to the discharge of waste from the near by industry. We could identify a variety of micro floral species and a few macro algal populations in the particular area. It is an important ecosystem with unique characteristics. However, it is also facing the problem of pollution from the chemicals released from the near by industries. It will affect the existence of the phytoplankton in the seacoast. Many of the micro algae identified either are completely marine, some are brackish and some are fresh or marine water species. This indicates the inevitable diversity of the species in that area. Therefore, any agency or Government Department should take proper care to understand and protect the micro flora, which plays an important role in maintaining the ecosystem in a unique way. Careless release and deposition of chemicals may ultimately collapse the stability and diversity of this marine ecosystem. This ecosystem needs more care and investigation in the nearby future.

DECLARARTION

I declare that the manuscript has not been published in any journal/book or proceedings or in any other publication, or offered for publication elsewhere in substantially the same or abbreviated form, in print or electronically.

REFERENCE

Anand, N. (1998). Indian Fresh water Microalgae. Bishen Singh Mahendrapal Singh, 23-A, New Connaught Place, Dehra Dun, 94pp.

Anu Lekshmi, Adith Mohan and Malini S. (2012). Environmental impact of KMML, Chavara. buisinessimpactenvironment.wordpress.com

APHA, (1995). Standard methods for the examination of water and waste (19th Ed.), American Public Health association, American water Works Association and water pollution control Federation, Washington, DC.

Jithesh Krishnan, R. (2008). Investigation on Hydrobiology and water quality Parameters of Periyar Lake, Thekkady, Kerala. Ph D Thesis, Mahatma Gandhi University, Kottayam , Kerala, 06pp.

Joanna Smith, Robert Brumbaugh, and Jennifer O'Leary (2019). The Nature Conservancy**,** unenvironment-nairobi-convention@un.org

Jurgen Schwoerbell (1972). Methods of Hydrobiology, Pergamon Press Ltd., Headington Hill Hall, Oxford, 3-30pp.

Madhav Gadgil, Krishnan b. J., Ganeshaiah K. N., Vijayan V. S., Renee Borges, Sukumar R., Ligia Naronha, Vidya S. Nayak, Subramaniam D. K., Varma R. V., Gautam S. P., Navalgund R. R., Subrahmanyam G. V.,

(2011). Report of the Western Ghats Ecology Expert Panel. Submitted to Ministry of Environment and Forests, Government of India.

Sanju Sinha, Naik, M. L.(1997). Phytoplankton and microphytes in the ponds of Raipur city area, Published by Ravishankar Shukla University, Raipur, Chhattisgarh, 17-130pp.

Santhanam, R., Velayutham, V., Jegatheesan, G. (1989). A manual of Freshwater Ecology, Daya Publishing House, Delhi, 10-81pp.

Trivedy, R. K. and Goel, P. K. (1986). Chemical and Biological method for water pollution studies. EM International Publishers, Karad, India.

Table-1: Phytoplankton density per 1Ltre water

Stations	**KM1**	**KM2**	**KM3**
Algae per Litre	1525	1050	925

Table-2: Identified phytoplankton of 3 different stations

KM1						
Sl. no	**SCIENTIFIC NAME**	**CLASS**	**Periphyton**	**Benthic**	**Lithophyte**	**Plankton**
1	*Ankistrodesmus sp.*	Chlorophyta	+	-	-	-
2	*Oedogonium sp.1*	"	+	-	-	-
3	*Tetraselmis marina*	"	+	-	-	-
4	*Ulothrix sp.*	"	+	-	-	+
5	*Aphanothece microscopica*	Cyanophyta	+	-	-	+
6	*Microchaete tenera*	"	+	+	-	+
7	*Phormidium retzii*	"	-	-	+	-
8	*Centronella sp.*	Bacillariophyta	+	-	-	+
9	*Gomphonema acuminatum*	"	+	-	+	-
10	*Navicula capitatoradiata*	"	-	-	+	-
11	*Navicula cryptocephala*	"	-	+	+	-
12	*Nitzschia amphibia*	"	-	-	+	-
13	*Nitzschia frustulum*	"	-	-	+	-
14	*Nitzschia linearis*	"	-	-	+	-
15	*Pinnularia sp.*	"	-	-	+	-
16	*Tabularia fasciculata*	"	+	+	-	+
KM2						
1	*Oedogonium sp. 1*	Chlorophyta	+	+	+	-
2	*Oedogonium sp. 2*	"	+	+	-	-
3	*Microchaete tenera*	Cyanophyta	+	+	-	+
4	*Mycrocystis sp.*	"	-	+	-	-
5	*Anomoeoneis sphaerophora*	Bacillariophyta	-	-	+	-

6	*Centronella sp.*	"	+	-	-	+
7	*Cocconeis placentula*	"	-	-	+	-
8	*Gomphonema sp.*	"	+	-	-	+
9	*Navicula accomoda*	"	-	-	+	-
10	*Navicula cryptocephala*	"	-	+	+	-
11	*Navicula incertata*	"	+	-	+	-
12	*Navicula phyllepta*	"	-	+	-	-
13	*Navicula subtilisima*	"	-	-	+	-
14	*Navicula veneta*	"	+	-	-	-
15	*Nitzschia amphibia*	"	-	-	+	-
16	*Nitzschia intermedia*	"	-	-	+	-
17	*Nitzschia palea*	"	-	-	+	-
18	*Polysiphonia sp.*	"	-	+	-	-
KM3						
1	*Actinastrum sps*	Chlorophyta	-	-	+	-
2	*Oedogonium sps 1*	"	+	+	+	-
3	*Spirogyra nov- angliae*	Charophyta	+	+	-	-
4	*Microchaete tenera*	Cyanophyta	+	+	-	+
5	*Oscillatoria sp.*	,,	+	-	-	+
6	*Synechococcus sp.*	„	+	-	-	-
7	*Achnanthes microcephala*	Bacillariophyta	-	-	+	-
8	*Amphora ovalis*	„	-	+	-	-
9	*Araphid sps*	„	-	-	+	-
10	*Nitzschia amphibia*	„	-	-	+	-
11	*Nitzschia frustulum*	„	-	-	+	-
12	*Nitzschia intermedia*	„	-	-	+	-
13	*Nitzschia linearis*	„	-	-	+	-
14	*Pyrocystis sp.*	Dinoflagellates	+	-	-	+

Table-3: Identified macro-algal species

Sl.no	SCIENTIFIC NAME	CLASS
1	*Caulerpa sp.*	Chlorophyta
2	*Ulva intestinalis*	,,
3	*Ulva lactuca*	„
4	*Spirogyra sp.*	Charophyta
5	*Sargassum sp.*	Phaeophyta
6	*Turbinaria ornata*	„
7	*Turbinaria sp.*	„
8	*Gracilaria sp.*	Rhodophyta