Pre-and Post Monsoon variation in Physico Chemical characteristics in Seawater quality of parts of Lakshadweep Islands, India

Nowfer Kuli [1]*, Saravanan Kumaresan[2] and Kumar Balachandar[3]
Centre of Advanced Study in Marine Biology, Faculty of Marine Sciences,
Annamalai University, Parangipettai – 608 502
*Corresponding Author: *Nowferkuli

Abstract

To comprehend the water chemistry and quality check the seawater samples were collected during different seasons from 14 locations of Agathi and Amini Islands of Lakshadweep. The present study showed that the seawater collected had both neutral and alkaline pH ranging 7.9-8.9. The pH during the Pre-monsoon and post-monsoon remained to be 7.9 and 8.9 respectively. The range of major ions in the water analyzed were found to be in the order of Ca> Mg>Na+K> Cl>SO_4> TDS>TH. The inference made by this study is that the seawater from study area is under permissible limits and is fit for lagoon including corals and related organisms according to the water quality standards.

Keywords: Agathi, Amini, Lagoon, Lakshadweep

Introduction

Seawater plays a major role in hydrological cycle. Four-lakh sq km area of Arabian Sea covered 36 Islands of Lakshadweep. There is no river and lakes like recourses. Islands are made up with corals and surrounded lagoons are setup with variety of corals (Pillai et al 2001). Sea bottom steeply diminish to depths quickly neap after reef with 7770sq km spreads continental shelf (George Varghese, 1990). Because of submarine Laccadive- chargo ridge oceanographers have special interest on Lakshadweep waters. This plays huge influence on flows of water body and contributes (Cooper, 1957)

Seawater is not polluted quickly but once it has polluted, the cleaning up is not much easier. Assessment of water quality is not only for the extant need but also to safe guard it for yet to come days (Mishra, and Balasubramanian, 2012). The drive of water to different zones and few anthropogenic activities contaminate the seawater and modify the hydrological cycle. Variations in the seawater may be due to alienation of minerals from soil and rock ,evapo-transpiration, cation exchange, oxidation and reduction, damp and arid, selective uptake by vegetation, precipitation of secondary minerals, fraternization of waters, leaching of fertilizers and manures from agricultural land, water pollution and other biological processes (Jayaraju, N., Sundara Raja Reddy and Reddy 2009).

Study area

Amini Island (station1) is located between 11" 06' 45"-11" 08' 06" N and72* 43' 02"-72* 44' 04" E. It was one of the first islands in the archipelago to inhabit and also known as cultural capital (Jagtap, 1991). Vastness area is 2.71 km^2 (1.05 sq mi) its include 2.8 km (1.74 mi) length and 1.3 km (0.81 mi) width. Coastline diffuses to 7 km (4.3 mi)**.** It is fringe by a reef 0.3 to 0.6 km wide. The lagoon is on the leeward (western) side with its depth in the range of 2 - 3 m(Samsudeen2006). The Amini Island is almost oval shape being broader in the centre and slightly narrowing at the ends.

Agatti Island (station2) is the westernmost island in the Indian Union Territory of Lakshadweep, located in between 10" 48' 48" - 10" 52' 38" N and 72* 09' 54" - 72* 12' 24" E.(Jagtap 1991). The island has an area of 2.7 km2 , and is surrounded by 12km2 of lagoon and 14.4 km2 of reef bar (Bahuguna and Nayak, 1994) lying in a roughly north to south direction. The local population of 7560 (Census of India, 2011) resides in the northern section of the island (see also Hoon et al., 2002 and Hoon et al., 2012). The traditional fishing and land rights of Agatti Islanders also include the Bangaram lagoon which encompasses the small uninhabited islands of Bangaram, Tinnakara, the Parellis, as well as the sunken reef of Perumal

Par

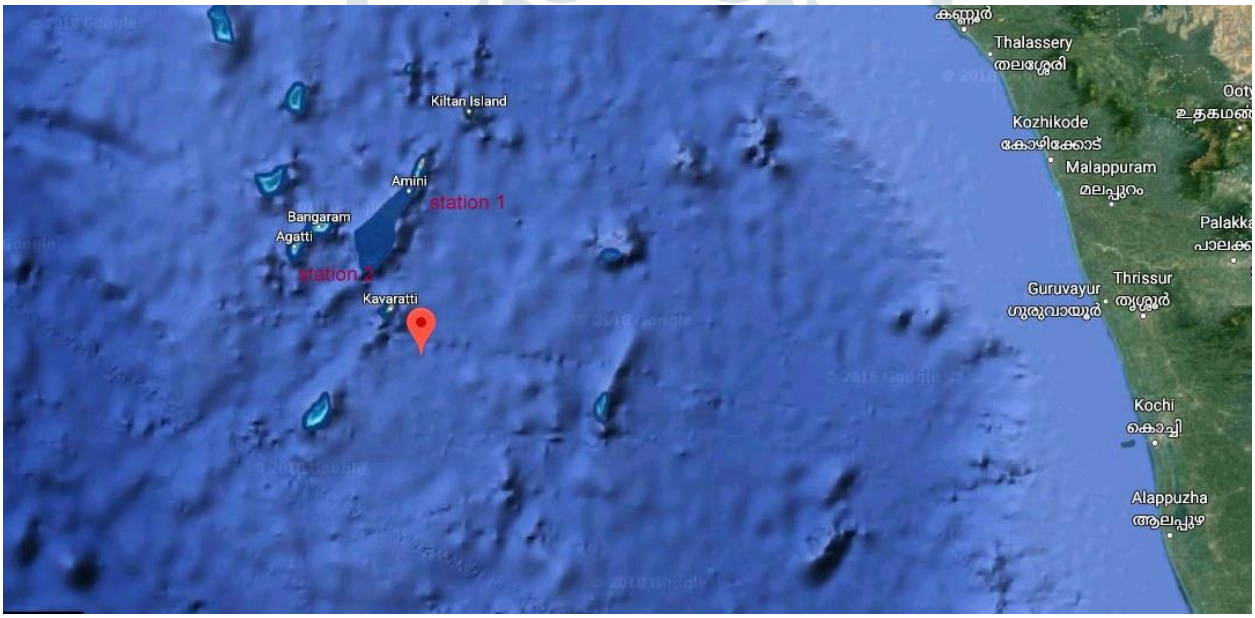

Figure 1 Agathi and Amini Islands of Lakshadweep

Materials and methods

Seawater from 14 sampling sites were collected during the pre (April) and post (November) 2016. The collection of sample, its preservation, analysis and interpretation were done ensuing Bureau of Indian standards (BIS). The samples were collected 50 – 100 metre away from the shore. Water samples from most of the possible sources were collected in polyethylene containers and labelled accordingly. The water samples collected were assessed for different water quality parameters like pH, total dissolved solids, total hardness, total alkalinity, calcium, magnesium, and chloride and sulphate concentration.

Result and discussion

Gross observation

The samples collected were gross observed for visible colour and odour and they were found to be colourless and odourless. The water quality parameters assessed were tabulated with reference to its range, change in the chemical nature and its reasons. The status of seawater in all the 14 sampling locations of both Islands of Lakshadweep has been clearly depicted in the in this study

NO	LOCATION	pH	Ca	Mg	Na+K	Cl	So4	TDS	TH
1	NORTH TIP	8.4	132	123	274	289	364	512	367
2	LIGHT HOUSE	7.9	124	193	179	531	139	1204	2412
3	FISHERIES JETTTY	8.1	173	163	217	287	189	1123	1174
4	HARBOUR JETTY	8.1	87	152	229	893	393	2214	974
5	HATCHERY	8.4	215	102	176	713	273	2174	867
6	EASTERN JETTY	8.4	119	111	197	961	978	2331	719
7	NIOT JETTY	8.2	184	89	163	418	182	1027	893

Table.1 physcio chemical parameter in Amini pre monsoon season

NO	LOCATION	pH	Ca	Mg	Na+K	Cl	So4	TDS	TH
1	HELIPAD	8.4	202	118	231	278	187	507	1151
2	NORTH-WEST SCHOOL	7.8	174	109	193	183	93	2240	621
3	NORTH SCHOOL	7.9	252	236	272	296	79	1071	341
4	EASTERN JETTY	8.1	113	207	173	162	91	1031	361
5	OLD EAST JETTY	8.2	179	169	219	109	124	831	692
6	WESTERN	8.6	242	173	189	331	148	2213	331

	JETTY								
7	FIBER FACTORY	8.3	132	103	221	1078	224	393	219

Table2. physcio chemical parameter in Amini post monsoon season

NO	LOCATION	pH	Ca	Mg	Na+K	Cl	So4	TDS	TH
1	HELIPAD	8.5	185				197	820	1151
2	NORTH-WEST SCHOOL	8.8	147	49	121	284	97	2054	465
3	NORTH SCHOOL	8.4	241	216	245	298	89	1062	494
4	EASTERN JETTY	8.5	97	147	142	149	45	1024	220
5	OLD EAST JETTY	7.9	181	163	216	135	139	786	584
6	WESTERN JETTY	8.3	214	198	124	303	48	2240	205
7	FIBER FACTORY	8.3	125	89	138	1106	72	378	175

Table 3. physcio chemical parameter in Agathi pre monsoon season

NO	LOCATION	pH	Ca	Mg	Na+K	Cl	So4	TDS	TH
1	NORTH TIP	8.6	120	118	223	234	110	480	299
2	LIGHT HOUSE	8.1	94	87	162	695	89	621	2619
3	FISHERIES JETTTY	8.3	142	152	208	370	126	1971	1235
4	HARBOUR JETTY	8.4	187	143	230	709	362	2182	260
5	HATCHERY	8.2	210	82	140	179	241	2174	782
6	EASTERN JETTY	8.6	108	98	263	1287	96	2014	896

7	NIOT JETTY	8.1	174	52	141	83	112	976	1144

Table 4. physcio chemical parameter in Agathi post monsoon season

pH

According to the BIS, the permissible range of hydrogen ion concentration in seawater is 7.9 to 8.2. The hydrogen ion concentration of the samples collected during the pre-monsoon season ranged between 7.9 to 8.4 with an average of 8.1. Similarly the hydrogen ion concentration of water sample collected in the post monsoon season was around 7.9 to 8.6 with an average of 8.3 This reveals that the hydrogen ion concentration lies within the permissible limit and the water is fit for related organism

Calcium

Calcium in seawater is 410 ppm , it is become under 1.2% by weight of the solids. Calcium in the natural water may be due to the deposition from rocks. The Calcium is one of the hardness determinants in water. The range of calcium in the Pre-monsoon and post monsoon collected samples remained in the range of 87mg/L to 215mg/L and 113mg/L to 252mg/L in Amini and 97 mg/L to 214mg/L and 94 mg/L to 210 mg/L in Agathi respectively.

Magnesium

Magnesium in seawater is 1300 ppm. It is the most common cation in oceans after Sodium and also a hardness determinant in water. Magnesium is deposited in water due to leaching of weathered rock. Certain anthropogenic activity is also responsible for the accumulation of magnesium in water bodies like effluents from industries. The magnesium content in the sample were found to be 89mg/L to 193mg/L and 49mg/L to 216mg/L during the pre monsoon and 103mg/L to 236mg/L to 25mg/L to 143 mg/L during the post-monsoon season in Amini and Agathi.

Sulphate

Sulphate level in typical seawater is 1.262 mg/l. Concentration of sulphate in a higher level will have a laxative effect along with calcium and magnesium. Sulphate concentration in all the samples collected during Pre- monsoon and Post- monsoon season were under the BIS prescribed limits.

Chlorides

Seawater chloride concentration in Seawater is 19,400 mg/L (a salinity of 35.0 ppt) (Parrish et al 1989). Chloride concentration in water is contributed by both natural and anthropogenic activities. The major source of chlorides in seawater from landfills industrial effluents and weathering of rocks it give salty taste and mineral content(Sawyer and Meerty1978, WHO 2004). high concentration Cl in sea water causes to enrich marine-derived drift. Only significant form of chlorine in natural water is Cl. The range of chloride in the water samples collected were around 287 to 961 mg/L and 109 to 1078 mg/L during the Pre and Post-monsoon season respectively in Amini and 135 to 1106mg/L and 83 to 1287mg/L during the Pre and Post-monsoon season respectively in Agathi.

Total Dissolved Solids

Total dissolved solids include all the inorganic and organic substance present in the water. The source of TDS in water can be due to industrial effluents, improper draining from sewage treatment plant etc (Hema.S, Subramani.T and Elango.L 2010)., increased levels of TDS makes the water unfit for fishes as well as other organism. The TDS concentration in the Pre and Post- monsoon season remained to be in the range of 512 to 2331mg/L and 393 to 2240mg/L and 378 mg/L to2054mg/L and 621 to 2184mg/L in Amini and Agathi respectively.

Total hardness

Total hardness of water can be contributed by calcium, magnesium and bicarbonates. Increased level of hardness in water causes plumbing of pipes and boilers (Millero and Feistel, 2008.). The total hardness in water was found to be in the range from Amini 219mg/L to 1151mg/L during the Post – monsoon and 367 mg/L to 2412 mg/L during the pre- monsoon and Agathi 229mg/L to 1144mg/L in post monsoon and 175mg/L to 584mg/L on pre monsoon.

Conclusion

To conclude, the present study evidences various reasons liable for the devastation of quality in the water. The sampling locations in Agathi and Amini Islands were concentrated because, this lagoon area entirely different character, size and human contacts. From the study we observed that the quality of water in the pre monsoon season remained better when compared to Pos- monsoon season. This is because after the Post- monsoonal rain, the water bodies would have diluted which in turn raised and dissolved the quality of water. The major reasons for polluted water include anthropogenic activity and urbanisation. According to the results of water chemistry analyse, water rock interaction is the reason for higher concentration of Cl, Na+K, TDS and TH. The study of origin of saline water at different locations was a major challenge during the course of time.

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