

Research Article

Seasonal Variation in Aquatic Biota in Relation to Physico-Chemical Parameters of Sonmiani, Balochistan, Pakistan

Nasratullah Baloch^{1*}, Naeem Tariq Narejo², Hamida Narejo³, Muhammad Farooq Hassan⁴, Muhammad Hanif Chandio⁵, Faheem Saddar⁶, Dharti Shahnawaz Thebo⁷, Ghulam Abbas⁸ and Shahnaz Rashid⁸

¹Education College Department, Government of Balochistan, Quetta, Pakistan; ²Department of Fresh Water Biology and Fisheries, University of Sindh, Jamshoro, Pakistan; ³Department of Sociology, University of Sindh, Jamshoro, Sindh, Pakistan; ⁴Department of Veterinary Pathology, Shaheed Benazir Bhutto University of Veterinary and Animal Sciences, Sakrand, Sindh, Pakistan; ⁵Department of Fisheries (Inland) Government of Sindh, Thandi Sarak, Hyderabad, Sindh, Pakistan; ⁶Department of Marine Fisheries, Government of Pakistan, West Warf, Karachi, Pakistan; ⁷Department of Zoology, University of Sindh, Jamshoro, Sindh, Pakistan; ⁸Centre of Excellence in Marine Biology, University of Karachi, Pakistan.

Abstract | Seasonal variation in phyto- and zooplankton (aquatic biota) in relation to physico-chemical parameters from Sonmiani Bay, Balochistan, Pakistan was studied from January to December 2016. For month-wise analysis of zoo- and phytoplankton was performed by using net of 25 µm mesh size. For the qualitative and computable examination of planktons, the 50 liters of bay water was strained and residue fixed with 5% formalin in sampling bottles. The 99 genera of both the planktons were recorded, which included 52 zoo- and 47 for phytoplankton from the experimental area. Among the zooplankton, *Copepods* were found to be rich 65% followed by *Brachyuran zoa* 15% while in case of phytoplankton genus *Coscinodiscus* were noted to be rich 60% followed by *Rhizosolenia* 15% during the whole duration of investigations. It reflects that the bay water was found to be rich with primary productivity. Vital physicochemical factor such as pH, temperature, salinity, dissolved oxygen, and transparency were taken into account twice in a month from sampling area during the whole period of research. The temperature found to be varied from 21-35.7°C, pH 8.0-8.1, DO 3.57-5.0 mg/l, salinity 34.2-39.9 mg/l and transparency 38.5-53.0 µS/cm. Lastly it was resolved that the atmosphere of Sonmiani bay found to be supportive for the aquatic biota (zoo and phytoplankton) which in turn conducive for the rearing of commercial fish species in it.

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***Correspondence** | Nasratullah Baloch, Education College Department, Government of Balochistan, Quetta, Pakistan; **Email:** munawarlal80@gmail.com

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Keywords | Aquatic biota, Zoo and phytoplankton, Seasonal variation, Sonmiani, Balochistan



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Introduction

Aquatic biota referred as primary productivity of any water body that is significantly dependent

on presence of micro-organisms (unicellular plants) reckoned as producers and their first users (unicellular animals) zoo and phytoplankton both are regarded as indicators of life in environment (Diaz *et al.*, 2006).

The kinds and numbers of species of fish existing in water body denoted their capacity in terms of biota directly or indirectly (Hashim *et al.*, 2016). The presence of producers, consumers and decomposers in form of micro and macrophytes, zooplanktons and fish in good quantity is necessary which reflects the pond or lake environment as productive one and ideal. According to Dastagir *et al.* (2014) any deviation in aquatic ecosystems is significantly affected by numerous physico-chemical factors, exclusively rapid rise and reduction in temperature readings. As a result, it is indispensable for regularly monitoring of pond assortment which would be profited for social well-being and species configuration. Further, Levêque *et al.* (2007) stated varieties of kinds of fish available in moderate areas are suggestively better-off in comparison to glaciated one. Various factors involved for the determining the quality of water that are very important not only for the drinking purpose but also for the culture of several aquatic organism. Few factors are considered as mandatory before the launching of any fish raising event (Hashim *et al.*, 2016). The deviation in certain factors of water seriously influenced not only the nature of the environment but at great extent on seasons as well.

The objectives of the study were to assess the seasonal variation in phyto- and zooplankton (aquatic biota) in relation to physico-chemical parameters from Sonmiani Bay, Balochistan, Pakistan.

Materials and Methods

The population of planktons were determined from Sonmiani bay through monthly sampling during January to December 2016. Two stations were selected in this region in such a way that the distance between both stations was 300 meters. In case of zooplankton 50 liters of water was filtered by net of 25 μ m. For quantifiable and qualitative examination, the samples were fixed with 5% formalin in sampling flasks. Zooplankton analyses (record and documentation) were taken place by using counting tray and binocular microscope 100 \times . Phytoplankton samples were procured with the use of plankton net, fixed with 3-4% formalin and their cyclical deviation was dogged after centrifuge at 1000 rpm for a period of 10-15 minutes. Phytoplankton residue then was counted drop by drop method by the usage of Sedgwick Rafter chamber. Documentation of both the planktons (zoo and phyto) was conceded through illustration and

keys as recommended (Desikachary, 1959; Prescott, 1962; Mizuno and Takahashi, 1991; Battish, 1992; Cook, 1996). Factors related to the quality of water were examined twice in a month during January-December 2016 from the experimental area. The water sample was obtained by using 4 liters capacity jar, the water was taken from surface and around 1-2 meters depth of the bay. All factors such as temperature, pH, salinity, total dissolved solids and conductivity were examined in the field through electronic analyzer (Model No. C-6030 USA made). Oxygen content was determined through titration method in the lab and Secchi disc was used for transparency.

Results and Discussion

Abundance of zooplankton

52 genera of zooplankton recognized from Sonmiani bay as shown (Figure 1). During the investigations the *Copepods* found highly rich (65%). Percentages of diverse zooplankton were *Brachyuran zoa* (15%), *Medusa* (6%), *Chaetognatha* (5%), *Carida larva* (4%) and *Foraminifera* was (3%). The *Brachyuran zoa* (15%), *Medusa* (6%) found at station 1 and 2, *Chaetognatha* (5%) abundant at station 1, 3 and 4, *Carida larva* (4%) was abundant at station 3 and 4, *Foraminifera* was (3%) at station 1, 2 and 3 during the month of March and *Ichthyo-plankton* was found abundant at station 1, 2 and 3 during the month of December to January 2016 (Figure 1).

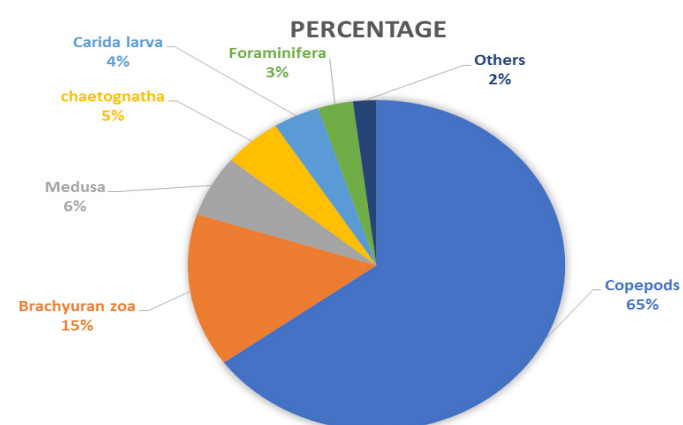


Figure 1: Zooplankton recognized from Sonmiani bay (Pakistan).

Phytoplankton abundance

Total 47 genus of phytoplankton identified from 4 stations of Sonmiani presented in Figure 2. It was noticed that a high abundance of phytoplankton was reported during the month of May to September 2016 and low abundance of phytoplankton was recorded in the month of December to February 2016. The

highest peak of total phytoplankton was observed 70,125 cell/l in the month of May. However, results of station no. 1 and 2 showed a high abundance of aquatic biota than other shore stations. The mean value of data collected from both stations was analysed. It was concluded that genus *Coscinodiscus* found to be most dominant from all station (50–60%) during the months of May to September 2016. The percentages of other genus are as follows:

Genus *Rhizosolenia* (15%) Genus *Noctiluca* (8%) at (St. 1, 2) in the month of March to April and October 2016, Genus *Biddulphia* (6%) at (St.1, 2) in the month of October to February 2016, Genus *Anaulus* (5%) at (1, 2) in the month of March to December 2016, Genus *Hemidiscus* (4%).

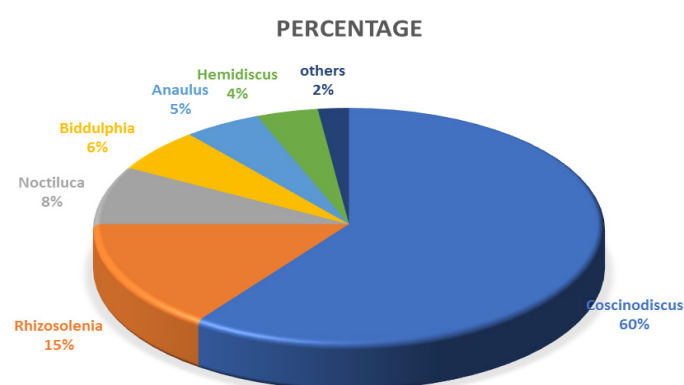


Figure 2: Phytoplankton identified from Sonmiani Bay (Pakistan).

Factors of physico-chemical

Various factors of physico chemical of water such as temperature, DO, pH, transparency, salinity was monitored and recorded throughout the year on fortnightly basis and shown in table (Table 1). The physicochemical parameter such as temperature,

pH, dissolved oxygen, transparency and salinity, were documented fortnightly at 9:00–11:00 AM and 3:00–4:00 PM during entire period of examination, the temperature was found to be deviated from 21.0–35.7°C, pH 8.0–8.1, DO 3.57–5.0mg/l, salinity 34.2– 39.9 and transparency 38.5–53.0 $\mu\text{S}/\text{cm}$. The Sonmiani bay was noted to be the ideal, safe, supportive and favors the aquatic biota, which in turn benefited for the rearing of economically important fish species.

The study was designed to elucidate the aquatic biota in terms physico-chemical factors of Sonmiani bay from January to December 2016. 52 genera of zooplankton recognized from Sonmiani bay during the examinations and the *Copepods* were found highly rich (65%). Percentages of diverse zooplankton were *Brachyuran zoa* (15%). *Medusa* (6%), *Chaetognatha* (5%), *Carida larva* (4%) and *Foraminifera* was (3%). Diverse investigators such as (Tripathi and Tiwari, 2006; Larik et al., 2007) suggested that for copepod *Cyclops* regarded as most common zooplankton species and for cladocerans *Moina*, *Bosmina* and *Daphnia* noted as exceptional. Tripathi and Tiwari (2006) provided evidence concerning to the availability of zooplankton from confined environment and commented that maximum kinds and types of planktons documented in bulk quantity during hot months as compared to less numbers and kinds during cold month alike observation was reported by (Larik et al., 2007) from hatchery. The observations of the above scientists agreed with the present research. Total 47 genus of phytoplankton identified during analyses the genus *Coscinodiscus* found to be most dominant (60%)

Table 1: Month-wise variation in different physico-chemical parameters of Sonmiani, Balochistan during (January to December 2016). Values are the mean of two stations (Mean \pm SE).

Months	pH	Temperature °C	Transparency $\mu\text{S}/\text{cm}$	Salinity ppt	Dissolved oxygen mg/L
January	8.0 \pm 0.5	21.0 \pm 1.0	53.0 \pm 1.5	39.9 \pm 1.1	4.85 \pm 1.15
February	8.1 \pm 0.25	24.0 \pm 1.0	50.75 \pm 1.25	38.7 \pm 1.30	5.0 \pm 0.50
March	8.02 \pm 0.8	28.0 \pm 1.5	47.7 \pm 2.30	37.6 \pm 1.40	4.15 \pm 0.85
April	8.07 \pm 0.25	32.0 \pm 1.2	45.5 \pm 2.50	37.4 \pm 0.60	4.0 \pm 1.5
May	8.02 \pm 0.80	35.7 \pm 1.2	41.2 \pm 1.80	36.4 \pm 0.60	3.57 \pm 0.43
June	8.02 \pm 0.8	33.2 \pm 1.8	40.4 \pm 2.6	35.2 \pm 0.8	3.85 \pm 1.15
July	8.0 \pm 0.2	32.8 \pm 1.2	39.8 \pm 1.2	35.0 \pm 0.5	4.0 \pm 0.5
August	8.0 \pm 0.50	32.0 \pm 1.6	38.5 \pm 2.50	34.7 \pm 0.30	4.05 \pm 0.95
September	8.1 \pm 0.90	28.5 \pm 1.5	44.2 \pm 1.80	34.2 \pm 1.80	4.22 \pm 0.78
October	8.01 \pm 0.9	25.5 \pm 1.5	47.5 \pm 1.5	35.2 \pm 0.80	4.27 \pm 0.73
November	8.05 \pm 0.45	23.5 \pm 1.0	49.0 \pm 1.50	35.9 \pm 1.10	4.22 \pm 0.78
December	8.02 \pm 0.8	21.5 \pm 1.5	51.2 \pm 1.80	38.1 \pm 1.90	4.70 \pm 0.30

followed by *Rhizosolenia* (15%), *Noctiluca* (8%), *Biddulphia* (6%), *Anaulus* (5%) and *Hemidiscus* (4%). Dissimilar scholars like (Aravind *et al.*, 2005; Larik *et al.*, 2007; Levêque *et al.*, 2007; Chughtai *et al.*, 2011) recommended that very communal kind of phytoplankton as *Keratellatropica* in confined water (lake) and rotifer as leading zooplankton. They also commented that deviation of planktons greatly influenced by the hot and cold region. Findings of mentioned authors are more or similar to the present investigations. Minute deviation in the interpretations possibly for the dissimilar ecological conditions of the aquatic ecosystems of the study area.

Numerous physico-chemical aspects of water exhibited essential part to determine its suitability for consumption, raising of aquatic animals and household purposes. Out of which certain significant that are known as very necessary for fish culture processes (Dastagir *et al.*, 2016). During the examinations, the temperature varied from 21.0-35.7°C, pH 8.0-8.1, DO 3.570-5.0 mg/l, salinity 34.2-39.9 mg/l and transparency 38.5-53.0 µS/cm. Variety of dissimilar authors (Larik *et al.*, 2007; Khuhawar *et al.*, 2009; Mahar *et al.*, 2010; Vohra *et al.*, 2012; Das and Sharma, 2012; Dastagir *et al.*, 2014, 2016) recommended that these aspects of physico-chemical nature of water mainly influenced by whether (cold and hot climate). The comments of aforesaid investigators are more or less similar to the observations obtained during the investigations. Physico-chemical parameters of Sonmiani bay were noted to be ideal and conducive for fish culture operations. Lastly, it has been decided that the ecology of Sonmiani bay Lasbela, Balochistan favourable for the aquatic biota which is suitable for the fish culture operation.

Conclusions and Recommendations

It was concluded from the present investigations that the Physico-chemical analysis of the Sonmiani bay found to be within the suitable ranges for the growth and propagation of aquatic biota which in turn is suitable for the stocking of commercial fish species. The Governmental, non-governmental organizations and print media should come forward to create awareness among the masses for the utilization of natural resources for food security in future.

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Novelty Statement

The present investigations show that the Physico-chemical analysis of Sonmiani bay was found to be within the suitable ranges for the growth and propagation of aquatic biota which in turn is suitable for the stocking of commercial fish species.

Author's Contribution

Nasratullah Baloch: Performed the experiment and prepared initial draft of the manuscript.

Naeem Tariq Narejo: Designed and conceived the idea of this experiment.

Hamida Narejo: Helped in checking of data.

Muhammad Farooq Hassan: Data analysis.

Muhammad Hanif Chandio: Searched the literature, manuscript reviewed, composed the document with data acquisition.

Faheem Saddar and Dharti Shahnawaz Thebo: Collected fish and eggs samples for the research.

Ghulam Abbas and Shahnaz Rashid: Helped in the relevant literature and assisting in formatting setting.

Conflict of interest

The authors have declared no conflict of interest.

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