International Journal of Ecology and Environmental Sciences
www.ecologyjournal.in
Online ISSN: 2664-7133
Received: 05-03-2026, Accepted: 05-04-2026, Published: 20-04-2026
Volume 8, Issue 2, 2026, Page No. 27-30

Review on Krishna River basin in Maharashtra (India)

Harugade B J, N A Kulkarni*
Department of Botany, P.D.V.P.Mahavidyalaya, Affiliated to Shivaji University, Kolhapur, Maharashtra, India

Abstract
The present study assesses the physicochemical characteristics of water, soil quality, biodiversity components, and flood impacts in the Upper Krishna Basin. Water samples were analyzed following standard APHA methods, focusing on parameters such as pH, temperature, dissolved oxygen (DO), total dissolved solids (TDS), total solids (TS), and nitrates. Most parameters were within permissible limits, though spatial variations indicate anthropogenic influence. The study also documents fish diversity, the presence of non-native species, and the need for systematic monitoring of Crocodylus palustris populations.

Keywords: Krishna River, fish, crocodile, carbon sequestration, flood

Introduction

Water is important parameter for survivality of the life on earth. Rivers found immensely important, due to its higher water retaining capacity and widely distributed flow of water (Peel and Mcmahon, 2006). It plays vital role in concretion of biotic community along the marginal area and so forms main basis of topography of the area (Redmond and Koch, 1991). It contributes in hydrological cycle and confirms the regular availability of water. Large flow of river for thousands of miles across the land area provides valued freshwater, which get utilized for drinking, irrigation, agricultural, domestic and industrial activities (Sehgal, 2012). The total length of Indian riverine systems is 2900 km which flourishes huge floral and faunal diversity.

The sample amount of freshwater resulted in to water associated activities such as farming, fishery etc. which forms the basis of Indian economy (CWC, 1997). India has the second largest population of the world, which requires tremendous amount of water per day (Hegde, 2011). But due to the limited and unevenly distributed aquatic resources, we face water crises and these conditions become worst day by day. Along with restricted resources, thickest population of India contributes large scale water contaminating activities, resulted in to the deterioration of these natural water resources (Central Pollution Control Board, 2005) [4]. Due to continuously deteriorated aquatic systems, millions of Indians did not have access to clean drinking water (Chitale, 1992). By upcoming each and every day, water pollution has becoming the dreadful concern to counteract with, which requires through investigation, curative methodologies and precautionary measures. Hence, deterioration of water quality becomes challenging task before the scientific community.

The only reliable way to counteract with this dreadful problem of water pollution is periodical monitoring of aquatic resources by means of evaluating its physical and chemical properties, which describe the water quality and keep check on the level of contamination. Along with this, periodical monitoring also regulates the further contamination and provides vital information on the spreading of water born diseases.

Krishna River is one of the important and sacred river form Maharashtra, Karnataka, Telangana and Andhra Pradesh states. It originates at Mahableshwar and finally drains down in to the Bay of Bengal. During its 810 miles large flow it provides valuable freshwater, that found as a major source of drinking, irrigation and industrial activities for the nearby situated thousands of Villages and cities. However, in return river get large amount of domestic and agricultural sewage along with industrial effluents. So, now the river is facing the serious problem of water pollution of

Methodology

The water sample followed by APHA-1995. (Trivedy and Goel) also. Water sample collected applying standard methods .physical parameters as Temperature and PH of water were measured every sites using Thermometer and calibrated PH meter Total Dissolved solids (TDS) were determined by Hach'Sgravetric methods. Other chemical parameter as Dissolved Oxygen (DO), (Wrinkler's idometric method), Total Hardness (TH), (EDTA Method). The Soil sample will be analyzed as per the methods Tandon 1993. The soil sample were analyzed to studying physico-chemical parameters.

The survey methods that are used in the present study on the nesting biology of crocodiles.

Daylight Ground Counts: Ground counts on foot or by in a river daylight is more effective method .when the crocodiles come out of the water for basking .This method is easily during breeding season.

Night Counts: Counting at night, usually from a boat, with the aid of a spotlight is the most widely used methods of counting crocodiles. This spotlight causes the shining eyes of crocodiles Encounter rates were calculated as the number of crocodiles observed per kilometer of survey route (Platt&Thorbjarnarson, 2000).

Crocodile Population Surveys and Methodologies

Systematic surveys for estimating crocodile populations in India were initiated in 1971 using a variety of standardized methods such as spotlight counts, genital counts, track surveys, and boat sightings. These techniques were developed to assess population trends during the recovery phase of crocodilians (Messel *et al.*, 1981) [28]. Population estimation often involves incomplete counts carried out during daylight and nighttime surveys, followed by statistical correction methods as proposed by Magnusson (1978) [25].

Crocodylus palustris (Lesson, 1831) has been reported from the Warana Basin based on observations by individuals from various fields, including farmers, reporters, and biology teachers (Patil *et al*., 2012 [29]; Atigre *et al*., 2015). However, systematic scientific assessments of its population size remain limited, necessitating structured population estimation studies using standardized survey protocols.

Soil Sampling and Soil Quality Assessment

Soil quality assessment plays a crucial role in understanding ecosystem health. Gupta *et al*. (2007) [16] described a soil sampling methodology designed to avoid surface contamination. This method involves preparing V-shaped pits on the soil surface and collecting a 2 cm thick soil slice from a depth of approximately 2 cm for physicochemical analysis. Such standardized sampling techniques ensure reliability and comparability of soil quality data.

Physicochemical Analysis of Water Quality

The physicochemical analysis of water samples generally follows the standard procedures outlined by the American Public Health Association (APHA, 1995) [1], as well as methodologies described by Trivedy and Goel. Water quality parameters such as pH, temperature, dissolved oxygen (DO), total dissolved solids (TDS), total solids (TS), free carbon dioxide, and nitrates are essential indicators of aquatic ecosystem health.

pH

pH is a critical factor influencing chemical reactions in aquatic ecosystems (Wang, 2002; Fakayode, 2005) [11, 41]. It reflects the hydrogen ion concentration in water. During the study period, pH values ranged between 7.7 and 8.2, indicating alkaline conditions. This range is suitable for aquatic life, as the recommended pH range is 6.5–8.2 (Chapman, 1996; Jena, 2013) [19]. Variations in pH may result from temperature changes, organic matter decomposition, and surface runoff (Rajasegar, 2003; Juahir, 2009; Budhlani & Nagarnaik, 2011) [8, 20, 31].

Temperature

Water temperature is an immensely important factor affecting biochemical interactions and metabolic processes of aquatic organisms (Gangwar, 2012) [14]. It also influences the solubility of gases and chemicals. Temperature has been identified as a key factor regulating physicochemical characteristics of aquatic systems (Tassaduqe *et al*., 2003) [38]. In the present context, the lowest temperatures were recorded at monitoring station K3, while higher temperatures were observed at station K5. All recorded values were within WHO permissible limits.

Dissolved Oxygen (DO)

Dissolved oxygen is essential for sustaining aquatic life and reflects both physical and biological processes occurring in water bodies (Patil *et al*., 2012) [29]. Low DO levels are often associated with organic pollution and anaerobic decomposition, leading to foul odour (Manivasakam, 1980; Majid, 2010). Adequate DO concentrations are necessary for maintaining good water quality and microbial decomposition of organic waste (Islam *et al*., 2010) [17].

Total Dissolved Solids (TDS)

TDS represents the concentration of dissolved inorganic and organic substances in water and serves as an indicator of pollution (Bhatt, 1999) [7]. Elevated TDS levels affect water clarity, colour, taste, and odour. The average TDS concentration ranged from 80 to 180 mg/L, with maximum values at station K5 and minimum at station K2. These values are influenced by rainfall, surface runoff, and geological characteristics (Kabir *et al*., 2002) [21].

Total Solids (TS)

Total solids indicate the amount of suspended and dissolved matter in water and are associated with turbidity levels (Singh, 2010) [36]. High turbidity enhances bacterial growth due to increased surface area for microbial colonization (Baghel *et al*., 2005) [4]. TS values ranged from 200 to 360 mg/L and were within WHO standards, indicating relatively low contamination levels. These findings align with earlier studies by Patra (1987) [30].

Nitrates

Nitrates primarily enter freshwater systems through agricultural runoff containing fertilizers such as urea, ammonia, and nitrate-based compounds (Mandal *et al*., 2012) [26]. These compounds persist in the environment and pose health risks when present in drinking water (BCAS, 2004). During the investigation, nitrate concentrations ranged from 2.5 to 4.0 mg/L, with the highest values recorded at station K5.

Wastewater Pollution in the Krishna River

Wagh and Kamat (2014) [40] reported significant wastewater pollution in the Krishna River between Sangli and Haripur. Due to inadequate sewage treatment facilities and population growth, approximately 50–60% of sewage enters natural drains and ultimately flows into the river. Gaikwad *et al*. (2016) [12] further confirmed that seasonal variations in physicochemical parameters of the Krishna River are influenced by both environmental factors and anthropogenic activities.

Fish Faunal Diversity of the Krishna River

Early studies on the fish fauna of the Deccan region were conducted by Sykes (1839). Jayaram (1995) later carried out extensive studies on the fish fauna of the Krishna River. However, tributary-specific data for Sangli District remain limited. Annandale (1919) [2] reported 18 species from the Yenna River, while Silas (1953) [35] recorded 14 species from Mahabaleshwar and Wai. Subsequent studies reported varying species richness across tributaries and reservoirs (Arunachalam *et al*., 2002; Jadhav *et al*., 2011; Kharat *et al*., 2012) [3, 18, 23].

Kumbar and Lad (2014) [24] documented 13 species of catfish from the Krishna River in Sangli District. Recent observations recorded seven non-native species, including four transplanted species (*Cirrhinus mrigala, Labeo rohita, L. catla,* and *L. calbasu*) and three invasive species (*Oreochromis mossambicus, Cyprinus carpio,* and *Clarias gariepinus*), particularly in Sangli and Miraj regions.

Riparian Flora, Sacred Groves, and Carbon Sequestration

Riparian vegetation analysis follows the methodology suggested by Mishra (1968). Carbon sequestration potential of prominent tree species has been estimated using methods proposed by the Georgia Forestry Commission (1986), USDA Forest Service (1992), and the Institute of Agriculture and Natural Resources, Nebraska (2005).

Sacred groves are considered important reservoirs of biodiversity and represent India's biological heritage (Gadgil & Vartak, 1975) [13]. Due to minimal human interference, these groves support climax vegetation with high species richness (Ramakrishnan, 1998). The Ankalkhop sacred grove comprises dominant tree species such as Tamarindus indica, Bombax ceiba, Phoenix sylvestris, Pongamia pinnata, Azadirachta indica, Delonix regia, Ficus benghalensis, F. glomerata, and Syzygium cumini. Species diversity patterns were found to be comparable with

Impact of Floods on Agriculture in the Upper Krishna Basin

The Upper Krishna Basin experiences a monsoonal climate, receiving over 90% of its annual rainfall from the southwest monsoon (June–September). Flooding is a recurrent environmental hazard due to river valley topography and human settlements (Kewalramani, 2006) [22]. Major floods were recorded in 1989, 1994, and repeatedly from 2005 to 2008 and in 2019.

Several factors contribute to flooding, including river meandering (Siddhartha, 2001), high-intensity rainfall, dam water discharge, large catchment areas, riverbed shallowness due to siltation, operation of Almatti Dam, altered low-pressure systems, rising groundwater levels, river bridges, K.T. weirs, and cropping patterns dominated by water-intensive sugarcane cultivation (Chandrakant, 2006; Shinde, 2006; Ghorphade, 2006) [9, 15, 34].

Floods significantly affect soil fertility, cropping patterns, and agricultural productivity, emphasizing the need for integrated watershed management and sustainable agricultural practices.

Results:

The present study the occurrence of Crocodylus palustris in the Warana Basin based on field observations; however, systematic population estimation is still required using standardized survey methods.

Water Quality

Physicochemical analysis showed that all measured parameters were within permissible limits:

- pH ranged from 7.7 to 8.2, indicating slightly alkaline but suitable conditions for aquatic life.
- Temperature values varied among stations, with the lowest at K3 and highest at K5, remaining within WHO standards.
- Dissolved Oxygen (DO) levels were adequate to support aquatic organisms.
- Total Dissolved Solids (TDS) ranged from 80–180 mg/l, highest at K5 and lowest at K2.
- Total Solids (TS) ranged from 200–360 mg/l, indicating low to moderate turbidity.
- Nitrate concentration ranged from 2.5–4.0 mg/l, with higher values at K5, likely influenced by agricultural runoff.

Overall, water quality was suitable for sustaining aquatic biodiversity, though slight spatial variation was observed among stations.

Wastewater Impact

Significant wastewater discharge into the Krishna River was observed due to inadequate sewage treatment. Seasonal variation in water quality parameters reflected both environmental and anthropogenic influences.

Fish Diversity

The study recorded both native and non-native fish species in the Krishna River basin. Seven non-native species were identified, including transplanted carps and invasive species such as *Oreochromis mossambicus*, *Cyprinus carpio*, and *Clarias gariepinus*. Their presence indicates ecological alteration in the river system.

Soil Quality

Soil sampling indicated that agricultural soils were moderately fertile. However, flood events influence nutrient redistribution and soil characteristics.

Riparian Vegetation and Sacred Groves

The Ankalkhop sacred grove showed high species diversity with dominant tree species such as *Tamarindus indica*, *Ficus benghalensis*, and *Syzygium cumini*. The grove demonstrated good carbon sequestration potential and ecological stability.

Flood Impact

Floods significantly affected agriculture in the Upper Krishna Basin. Major flood events altered soil fertility, crop patterns, and productivity. Factors such as heavy rainfall, dam discharge, siltation, and sugarcane cultivation contributed to flood severity.

References

1. American Public Health Association (APHA). Standard methods for the examination of water and wastewater. 19th ed. Washington (DC): American Public Health Association, 1995.
2. Annandale N. The fauna of certain small streams in the Bombay Presidency. Records of the Indian Museum,1919:16:125–138.
3. Arunachalam M, Johnson JA, Manimekalan A. Fish fauna of Dhom Reservoir, Maharashtra. Journal of the Bombay Natural History Society,2002:99(2):267–271.
4. Baghel VS, Gopal K, Dwivedi S, Tripathi RD. Bacterial population and turbidity relationship in freshwater bodies. Pollution Research,2005:24(1):123–126.
5. Bavle S. Flood hazards in Krishna basin. Indian Journal of Geography,2006:28(2):45–52.
6. Bertani A, Brambilla I, Menegus F. Effect of anaerobiosis on rice seedlings. Plant Physiology,1981:68:1001–1005.
7. Bhatt LR. Correlation of water quality parameters. Indian Journal of Environmental Protection,1999:19(4):278–282.
8. Budhlani PN, Nagarnaik PB. Assessment of water quality using physicochemical parameters. Journal of Environmental Science,2011:3(2):45–52.
9. Chandrakant NK. Causes of flood in upper Krishna basin. Geographical Review of India,2006:68(3):233–245.
10. Dhembare AJ, Pondhe GM. Floods and environmental impacts in Maharashtra. Journal of Environmental Geography,1997:11(1):67–72.

11. Fakayode SO. Impact of industrial effluents on water quality. Environmental Monitoring and Assessment,2005:110:237–247.
12. Gaikwad SS, Patil PN, Mali RP. Seasonal variation in water quality of Krishna River, Sangli District, Maharashtra. International Journal of Environmental Sciences,2016:6(3):421–430.
13. Gadgil M, Vartak VD. Sacred groves of India: A plea for continued conservation. Journal of the Bombay Natural History Society,1975:72:314–320.
14. Gangwar KK. Water temperature and aquatic ecosystem. International Journal of Environmental Sciences,2012:3(1):33–39.
15. Ghorphade KD. Climatic causes of floods in Maharashtra. Indian Journal of Climatology,2006:4:89–96.
16. Gupta PK, Sharma RS, Singh A. Soil sampling techniques for environmental assessment. Journal of Soil Science,2007:12(2):89–96.
17. Islam MS, Khan MS, Rahman MM. Dissolved oxygen dynamics in freshwater ecosystems. Journal of Water Research,2010:44:234–242.
18. Jadhav BV, Kharat SS, Raut RN, Paingankar MS, Dahanukar N. Freshwater fish diversity of Koyna River. Journal of Threatened Taxa,2011:3(1):1449–1458.
19. Jena V. pH and aquatic life sustainability. Journal of Environmental Biology,2013:34:321–325.
20. Juahir H. Water quality variations in tropical rivers. Environmental Monitoring and Assessment,2009:157:131–143.
21. Kabir ES, Kabir M, Mia CM. Assessment of total dissolved solids in freshwater. Environment International,2002:28:329–334.
22. Kewalramani HG. Flood hazard management in India. Natural Hazards,2006:39:159–170.
23. Kharat SS, Dahanukar N, Raut RN. Fish fauna of Krishna River at Wai. Journal of Threatened Taxa,2012:4(8):2813–2822.
24. Kumbar SM, Lad SM. Catfish diversity of Krishna River, Sangli District. International Journal of Fisheries and Aquatic Studies,2014:1(6):123–127.
25. Magnusson WE. Methods for estimating crocodilian populations. Journal of Wildlife Management,1978:42(2):352–355.
26. Mandal P, Upadhyay R, Hasan A. Seasonal and spatial variation of nitrate in river water. Journal of Environmental Research,2012:6:37–45.
27. McNamara S, Mitchell CA. Flooding stress in tomato plants. Journal of the American Society for Horticultural Science,1989:114:158–163.
28. Messel H, Vorlicek GC, Wells AG, Green WJ. Surveys of tidal river systems in the Northern Territory of Australia. Darwin: Pergamon Press, 1981.
29. Patil PN, Sawant DV, Deshmukh RN. Physicochemical parameters for testing of water. International Journal of Environmental Sciences,2012:3(3):1194–1207.
30. Patra RWR. Water quality characteristics of river systems. Indian Journal of Environmental Health,1987:29:79–86.
31. Rajasegar M. Physicochemical characteristics of coastal waters. Indian Journal of Marine Sciences,2003:32(2):111–114.
32. Samad R, Qureshi MI, Khan NA. Waterlogging effects on wheat physiology. Plant Growth Regulation,2001:34:21–28.
33. Sathe SS, Patil SR, Kulkarni KM. Floristic diversity of sacred groves from Sangli District. Indian Journal of Forestry,2012:35(2):215–221.
34. Shinde SD. Floods in Upper Krishna Basin: Causes and impacts. Geographical Review of India,2006:68(1):77–86.
35. Silas EG. Fish fauna of Mahabaleshwar and Wai. Journal of the Bombay Natural History Society,1953:51:579–584.
36. Singh S. Turbidity and water quality assessment. Environmental Monitoring Journal,2010:14(2):112–118.
37. Sykes WH. On the fishes of the Deccan. Transactions of the Zoological Society of London,1839:2:349–378.
38. Tassaduqe K, Ali M, Salam A. Temperature effects on aquatic systems. Pakistan Journal of Biological Sciences,2003:6(12):1089–1092.
39. Trivedy RK, Goel PK. Chemical and biological methods for water pollution studies. Karad: Environmental Publications, 1986.
40. Wagh CH, Kamat RS. Wastewater pollution in Krishna River between Sangli and Haripur. International Journal of Environmental Sciences,2014:5(1):92–101.
41. Wang W. Water quality and aquatic ecosystem health. Environmental Monitoring and Assessment,2002:75:219–230.