

Mapping of coastal resources and identifying suitable areas for expanding integrated multi-trophic aquaculture (IMTA) in Maharashtra

Report period - October 2018 to March 2019

Introduction

The aquaculture is an inexpensive source of protein and an important cash crop in many regions of the world, and water is the physical support in which they carry out their life functions of aquatic organisms. Water quality is determined by various physio-chemical and biological factors, as they may directly or indirectly affect health and growth of fish and other aquatic animals. So they all living organisms have tolerable limits of water quality parameters in which they perform optimally. Therefore, there is the need to ensure that, these environmental factors are properly managed and regulated for good survival and optimum growth of fish. The role of various factors like temperature, Depth, Water current flow, turbidity, dissolved Oxygen, pH, ammonia, nitrite, nitrate, phosphate, and chlorophyll *a* are the influencing factors for expanding integrated multi-trophic aquaculture (IMTA) in Maharashtra state.

Shrimp aquaculture area has increased from 65,100 ha in 1990-91 to 130948 ha in 2015-16 and continue to grow further. The success of shrimp farming opened up the floodgates for investments in shrimp farming projects and this trend was strengthened by the adoption of scientific farming technology by a section of private entrepreneurs. During early 1990s, there was a gold rush for shrimp farming which resulted in unregulated rapid growth. This has raised some environmental concerns such as conversion of important coastal ecosystems like lakes, mangroves and agricultural lands to aquaculture farms and salinization of soil and drinking water resources. With the large unutilized brackishwater areas, use of other land classes such as agriculture, mangroves indicated that there was not planning for development of aquaculture.

Due to the environmental issues, aquaculture has been regulated with the enactment of Coastal Aquaculture Authority (CAA) Act 2005. Under this act, CAA was established and empowered to regulate coastal aquaculture by regulating aquaculture development. The existing regulatory guidelines include, no new farms to be established within 200m from high tide line, non-use of agricultural lands and mangroves and provision of various buffer-zones between different land types. Planning for sustainable aquaculture development and formulation of master plan requires, adhering to CAA guidelines, Environment Impact Assessment (EIA), integrating aquaculture with coastal zone management plans and site-specific designing of farms.

Aquaculture planning and management, like many other natural resource based economic activities, is inherently spatial. The conventional methods used in estimation of aquaculture areas such as manual surveying, collection of secondary data from the farmers field or revenue records are labour intensive, time consuming, non-repetitive, inaccessible to remote areas, low in accuracy and not synoptic. It does not provide information on the associated land features of aquaculture farms. Hence, there is a need for a mechanism to get real time data with its associated features for the larger area assessment so that coastal resources can be utilized effectively.

Remote sensing integrated with GIS can play a major role in sustainable shrimp culture development by providing information on land use/land cover, water quality, productivity, tidal influence and coastal infrastructure. These tools help us to maintain the sustainability of shrimp culture through proper site selection by considering the impact of the development on other land use activities like agriculture, protected areas like sanctuaries, human uses etc that are part of the same eco system. By using remote sensing technique and GIS, the advantage is not only in time and cost effectiveness but also in achieving a more comprehensive and integrated pattern of aquaculture development criteria, which is difficult through conventional techniques

Specific objectives of the study:

- ❖ To conduct the preliminary survey and identify the suitable areas for IMTA in Palghar, Thane, Raigad, Ratnagiri, and Sindhudurg districts of Maharashtra
- ❖ To assess land use pattern from satellite data and GIS, carrying capacity, water availability and water quality characteristics in the major source water bodies to select the suitable areas for IMTA through GIS based MCDSS

Assessment of suitability of environmental factors such as waterbodies characteristics, quality and land and water resource pattern.

The present study was carried out for five districts of Maharashtra (Palghar, Thane, Raigad, Ratnagiri and Sindhudurg). Water samples were collected from selected location of creeks and rivers associated with mangroves environments. Water bodies characteristics such as Depth, Water Current flow, Temperature, Salinity, pH and Dissolved Oxygen were analysed immediately on the sampling location and chlorophyll *a* content also filtered on the same day. The Chemical and Biological parameters such as Nitrate, Nitrite, Ammonia, Phosphate, Total Phosphorus and Chlorophyll *a* were measured after brought to the laboratory as per standard procedures.

Estimation of water quality parameters

1. **Temperature (°C)** - The temperature was measured using standard mercury centigrade thermometer (0° - 110°C) accuracy.
2. **pH** - The hydrogen ion concentration was measured using a pH pen (ERMA-035) with an accuracy of ± 0.1. pH pen was recalibrated with standard buffer solutions of pH 7.0 and 9.0 before the water testing.
3. **Salinity (ppt)** - Salinity was measured using a hand-held Refractometer (ATAGO: 0341109, Japan)
4. **Turbidity** was measured by using the Nephelometric method (Turbidity meter-Model-ELICO CL52D)
5. **Water Current Flow in** Creeks and river was measured by Current Flow meter (FP211 water velocity meter BB1100) and expressed as feet/second.
6. **Dissolved oxygen (DO)** was measured using Digital DO meter -Thermo scientific, ORION STAR, A223 and expressed in mg/l.
7. **Chlorophyll *a*** concentration was estimated by pigment extraction method using 90% acetone. Extracted samples were kept for incubation in the refrigerator under the dark

condition and the pigment concentration was obtained through UV-VIS spectrophotometer (Shimadzu-UV-1800) at 630 nm, 645 nm, and 665 nm (Strickland and Parsons, 1972) and given in mg/l.

8. **Ammonia (NH₄)** was measured using Spectrophotometric method by Strickland and Parsons (1972)
9. **Nitrite (NO₂)** - Nitrite was determined by using Spectrophotometric method as described by Strickland and Parsons (1972) and given in mg/l.
10. **Nitrate (NO₃)** - Nitrate was measured by using the spectrophotometric method as described by Strickland and Parsons (1972) and given in mg/l.
11. **Phosphate (PO₄)**
Phosphate was measured by using the spectrophotometric method as described by Strickland and Parsons (1972) and given in mg/l.

PALGHAR DISTRICT

Water quality in Dahanu River, Ghivali Creek, Banganga River, Murba Creek, Murpo satpathi River, Makunsar Creek and Vaitarna River covering villages Dahanu, Dhumkhet, Chandigone, Pale, Matgaon, Dhakati Dahanu, Agwaon, Asangaon, Ghivale, Pantambi, Dandi, Vikaswadi, Daboli, Mochimar Kelve, Makunsar, Zenda Aali, Datiware, Vehaloli, Kharmendi, Tembikhodave, Kasarali, Karvele, Vadhi, Khardi and Vedhi were assessed in Palghar district and results are given in Table 1 & 2. Figure 2a-2d & 3a-3i indicates the spatial interpolation map of the creeks water quality parameters in Palghar district. Figures 3-15 indicates the assessment of physical characteristics of waterbodies.

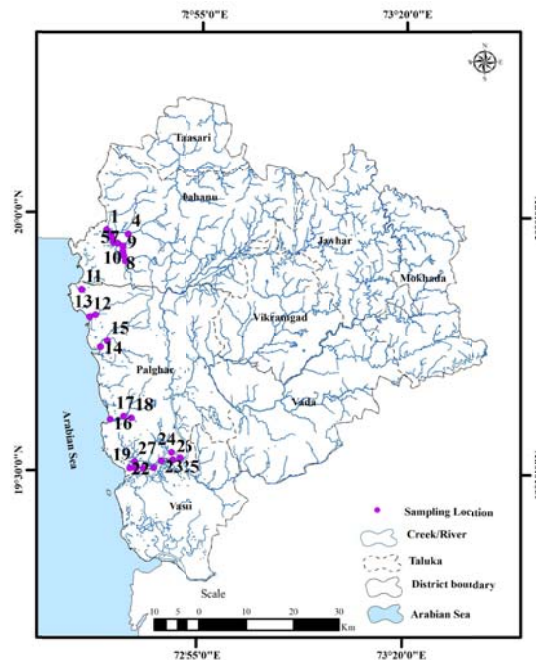


Fig 1. Sampling location & source water bodies mapping in Palghar District

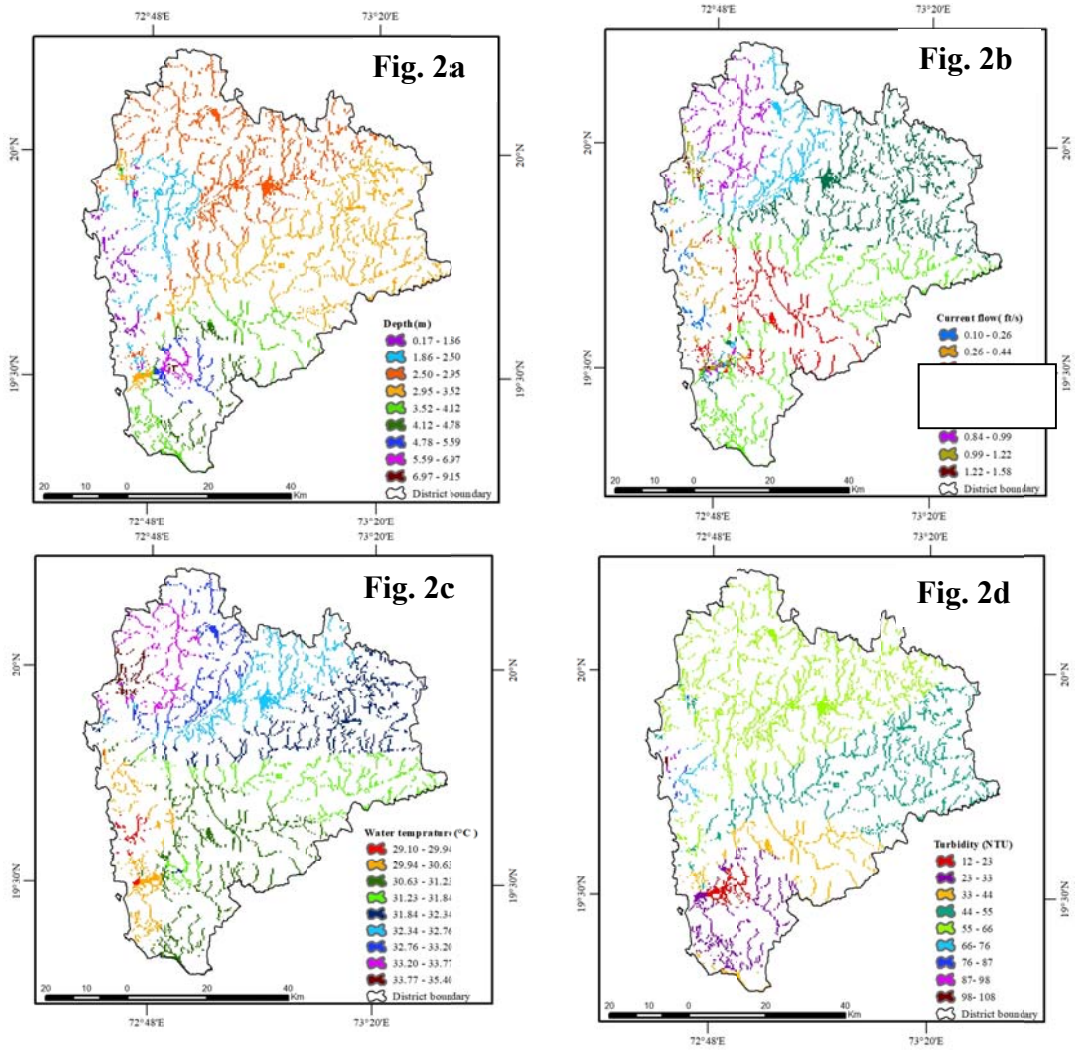


Fig.2 Mapping of creeks water quality parameters in Palghar district. 2a. Depth; 2b. Current flow; 2c. Water temperature; 2d. Turbidity

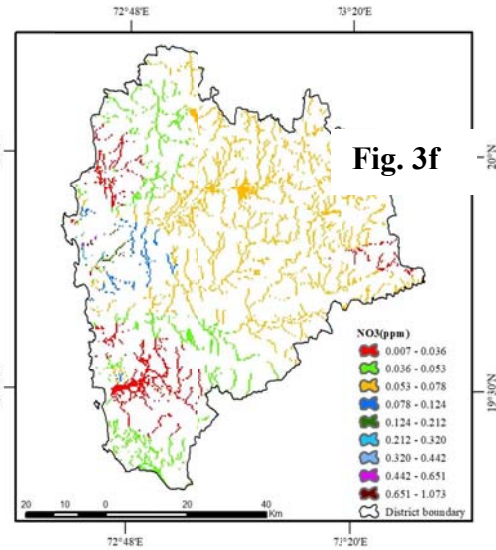
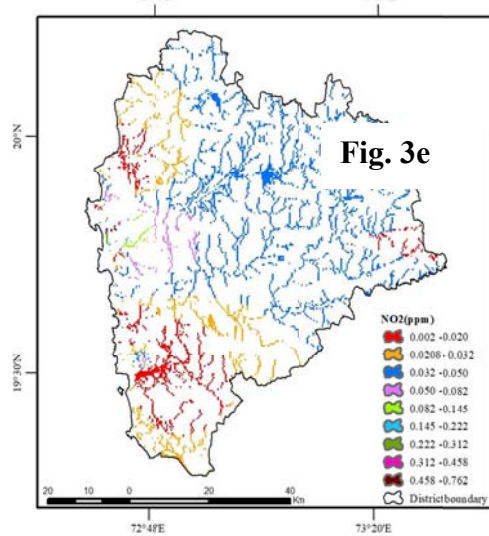
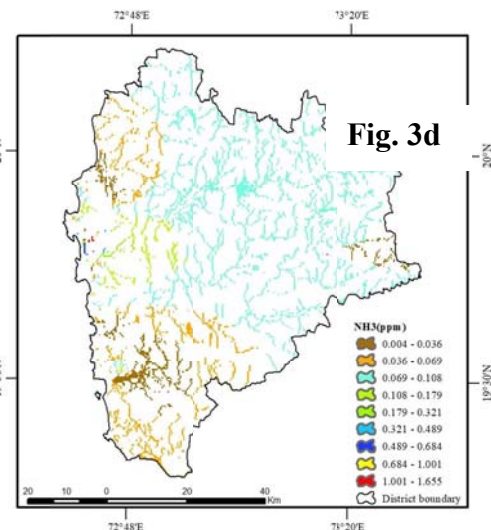
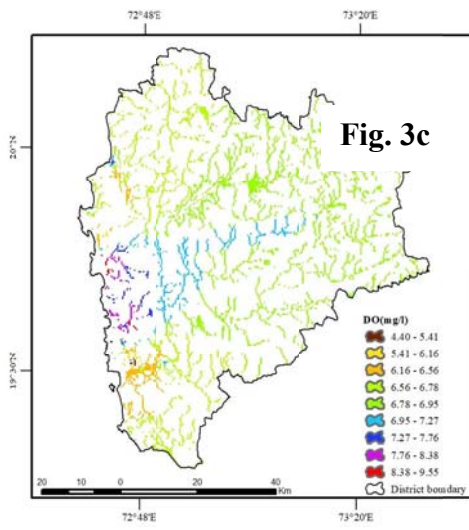
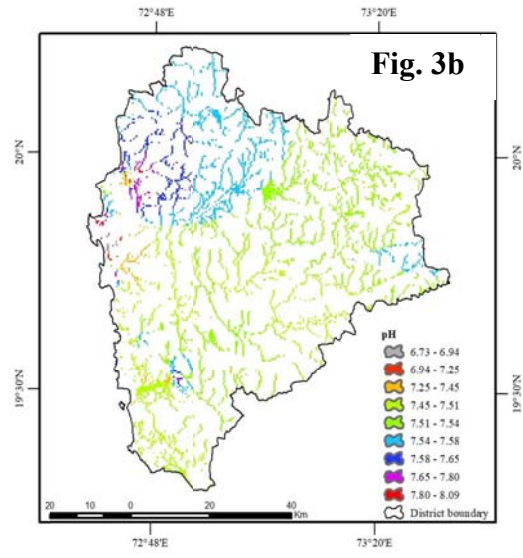
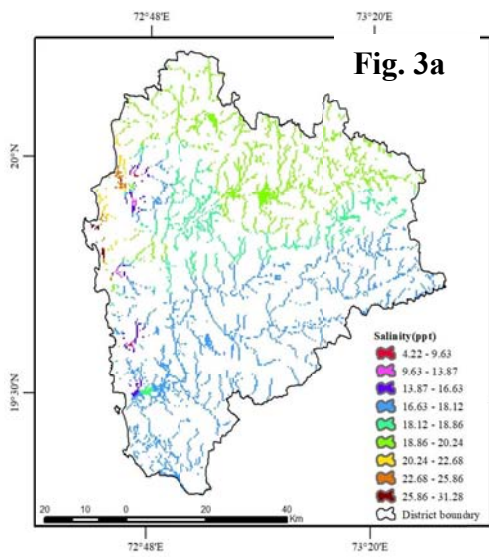


Fig.3 Spatial interpolation mapping of creeks water quality parameters in Palghar district 3a. Salinity; 3b. pH; 3c. DO; 3d. NH₃; 3e. NO₂; 3f. NO₃

Fig.3 Spatial interpolation mapping of creeks water quality parameters in Palghar district 3a. Salinity; 3b. pH; 3c. DO; 3d. NH₃; 3e. NO₂; 3f. NO₃

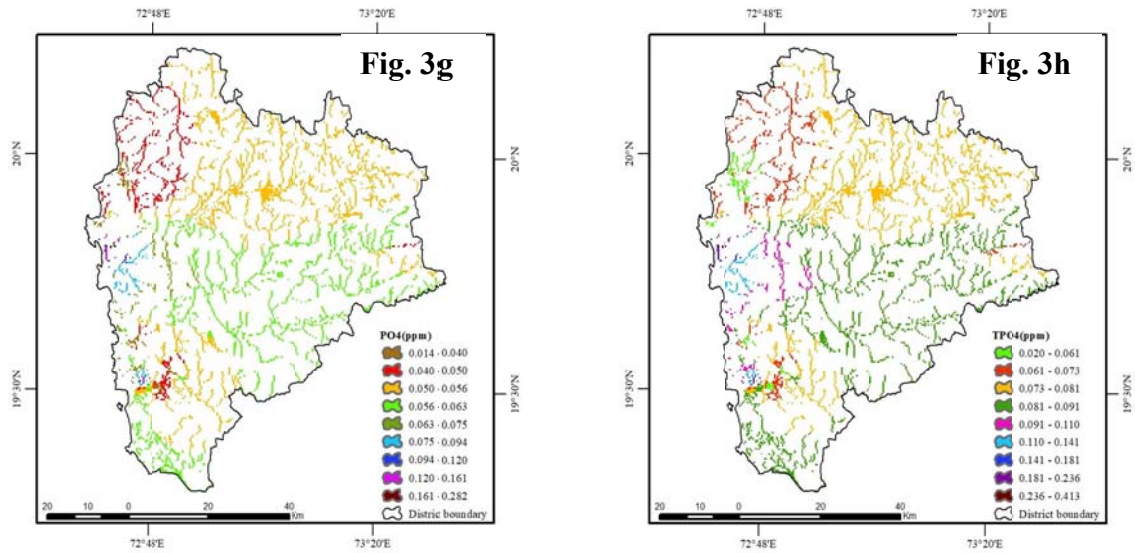


Fig.3 Spatial interpolation mapping of creeks water quality parameters in Palghar district 3g. PO₄; 3h. TPO₄; & 3i. Chlorophyll *a*

Fig.4. Measurements of Physical Characteristics of Dahanu Creek in Agwaon village at Palghar District

Fig.5. Characteristics of Dahanu Creek in Dahanu village at Palghar District

Fig.6. Characteristics of Dahanu Creek in Asangaon village at Palghar District

Fig.7. Characteristics of Ghivale Creek and its in Ghivale village at Palghar District

Fig.8. Characteristics of Banganga Creek and its surroundings in Pamtembi village at Palghar district

Fig.9. Characteristics of Banganga Creek and its surroundings in Dandi village at Palghar district

Fig.10. Characteristics of Murba Creek and its surroundings in Vikaswadi village at Palghar district

Fig.11. Characteristics of Murpo Satpathi Creek and its surroundings in Daboli village at Palghar district

Fig.12. Characteristics of Makunsar Creek and its surroundings in Mochimar Kelve village at Palghar district

Fig.13. Characteristics of Makunsar Creek and its surroundings in Makunsar village at Palghar district

Fig.14. Characteristics of Makunsar Creek and its surroundings in Zenda Aali village at Palghar district

Fig.15. Characteristics of Vaitrana Creek and its surroundings in Karvele village at Palghar district

Table 1. Physical characteristics of Palghar district in SWM season

| S. No. | Creek | Village | Depth (m) | | Current flow Average (ft/s) | Temp (°C) | Turbidity (NTU) |
|--------|----------------------|----------------|-----------|-----|-----------------------------|-----------|-----------------|
| | | | HT | LT | | | |
| 1 | Dahanu Creek | Dahanu | 5.6 | 4.5 | 0.80 | 33 | 65 |
| 2 | | Dhumkhet | 6.2 | 4.0 | 1.60 | 35 | 58 |
| 3 | | Chandigone | 4.7 | 3.5 | 1.20 | 35 | 66 |
| 4 | | Chandigone | 5.0 | 3.4 | 1.00 | 36 | 80 |
| 5 | | Pale | 4.1 | 2.7 | 1.30 | 34 | 53 |
| 6 | | Pale | 3.7 | 2.1 | 1.20 | 34 | 42 |
| 7 | | Matgaon | 3.6 | 2.4 | 1.60 | 33 | 44 |
| 8 | | Dhakati Dahanu | 2.0 | 2.6 | 1.40 | 35 | 51 |
| 9 | | Agwaon | 3.0 | 1.0 | 0.20 | 34 | 55 |
| 10 | | Asangaon | 3.3 | 1.0 | 0.20 | 32 | 69 |
| 11 | Ghivale Creek | Ghivale | 2.5 | 1.5 | 0.10 | 32 | 48 |
| 12 | Banganaga River | Pamtembi | 2.0 | 1.0 | 0.10 | 31 | 96 |
| 13 | | Dandi | 2.7 | 1.5 | 0.50 | 30 | 110 |
| 14 | Murba Creek | Vikaswadi | 3.7 | 1.0 | 0.10 | 30 | 84 |
| 15 | Murpo satpathi Creek | Dapoli | 3.0 | 1.5 | 0.20 | 30 | 70 |
| 16 | Makunsar Creek | Mochimar Kelve | 2.3 | 1.0 | 0.10 | 29 | 73 |
| 17 | | Makunsar | 4.0 | 1.0 | 0.10 | 29 | 50 |
| 18 | | Zenda Aali | 2.5 | 1.2 | 0.10 | 29 | 70 |
| 19 | Vaitrana River | Datiware | 3.0 | 2.5 | 0.20 | 29 | 29 |
| 20 | | Vehaloli | 3.7 | 2.0 | 1.60 | 30 | 22 |
| 21 | | Kharmendi | 3.3 | 2.8 | 1.10 | 30 | 16 |
| 22 | | Tembhikhodave | 5.5 | 3.5 | 0.10 | 31 | 20 |
| 23 | | Kasarali | 6.0 | 5.2 | 1.30 | 31 | 15 |
| 24 | | Karvele | 5.9 | 3.0 | 1.20 | 32 | 12 |
| 25 | | Vadhi | 5.9 | 2.3 | 0.30 | 32 | 19 |
| 26 | | Khardi | 9.3 | 2.7 | 0.20 | 32 | 17 |
| 27 | | Vedhi | 3.1 | 1.5 | 0.10 | 31 | 55 |

Table 2. Chemical and biological characteristics of Palghar district in SWM season

| S. No. | Creek | Village | Salinity (ppt) | pH | DO (mg/l) | NH ₃ (ppm) | NO ₂ (ppm) | NO ₃ (ppm) | PO ₄ (ppm) | Chlorophyll <i>a</i> (mg/m ³) |
|--------|-----------------|----------------|----------------|------|-----------|-----------------------|-----------------------|-----------------------|-----------------------|---|
| 1 | Dahanu Creek | Dahanu | 23 | 7.60 | 6.86 | 0.028 | 0.015 | 0.018 | 0.047 | 0.505 |
| 2 | | Dhumkhet | 27 | 7.10 | 6.05 | 0.016 | 0.013 | 0.012 | 0.038 | 0.119 |
| 3 | | Chandigone | 25 | 7.30 | 6.41 | 0.016 | 0.008 | 0.009 | 0.024 | 0.658 |
| 4 | | Chandigone | 25 | 7.20 | 6.27 | 0.017 | 0.004 | 0.011 | 0.030 | 0.313 |
| 5 | | Pale | 20 | 7.70 | 6.76 | 0.015 | 0.003 | 0.007 | 0.043 | 0.408 |
| 6 | | Pale | 17 | 7.80 | 6.83 | 0.012 | 0.008 | 0.011 | 0.037 | 0.145 |
| 7 | | Matgaon | 14 | 7.70 | 6.55 | 0.018 | 0.005 | 0.006 | 0.047 | 0.337 |
| 8 | | Dhakati Dahanu | 25 | 7.80 | 7.72 | 0.019 | 0.002 | 0.012 | 0.035 | 0.412 |
| 9 | | Agwaon | 4 | 8.10 | 6.63 | 0.062 | 0.022 | 0.040 | 0.045 | 0.213 |
| 10 | | Asangaon | 11 | 7.80 | 6.26 | 0.015 | 0.010 | 0.013 | 0.042 | 0.149 |
| 11 | Ghivale Creek | Ghivale | 28 | 7.90 | 6.88 | 0.034 | 0.003 | 0.018 | 0.013 | 0.482 |
| 12 | Banganaga River | Pamtembi | 20 | 6.70 | 5.47 | 1.798 | 0.828 | 1.166 | 0.302 | 4.266 |
| 13 | | Dandi | 32 | 6.80 | 6.37 | 0.027 | 0.007 | 0.015 | 0.061 | 1.020 |
| 14 | Murba Creek | Vikaswadi | 23 | 7.70 | 9.57 | 0.004 | 0.004 | 0.019 | 0.072 | 1.161 |

| | | | | | | | | | | |
|----|----------------------------|-------------------|----|------|------|-------|-------|-------|-------|-------|
| 15 | Murpo satpathi Creek | Dapoli | 10 | 7.40 | 7.78 | 0.037 | 0.007 | 0.024 | 0.082 | 0.911 |
| 16 | Makunsar Creek | Mochimar Kelve | 23 | 7.50 | 8.50 | 0.019 | 0.010 | 0.015 | 0.089 | 0.811 |
| 17 | | Makunsar | 8 | 7.50 | 7.57 | 0.004 | 0.002 | 0.021 | 0.036 | 0.502 |
| 18 | | Zenda Aali | 19 | 7.60 | 9.31 | 0.003 | 0.003 | 0.020 | 0.030 | 0.698 |
| 19 | Vaitrana River | Datiware | 15 | 7.50 | 6.49 | 0.014 | 0.006 | 0.018 | 0.042 | 0.286 |
| 20 | | Vehaloli | 19 | 7.50 | 6.50 | 0.014 | 0.003 | 0.023 | 0.046 | 0.387 |
| 21 | | Kharmendi | 19 | 7.50 | 6.70 | 0.016 | 0.004 | 0.020 | 0.056 | 0.155 |
| 22 | | Tembhikhodave | 18 | 7.50 | 6.23 | 0.019 | 0.006 | 0.025 | 0.029 | 0.351 |
| 23 | | Kasarali | 18 | 7.40 | 6.46 | 0.006 | 0.002 | 0.015 | 0.046 | 0.491 |
| 24 | | Karvele | 18 | 7.60 | 6.32 | 0.006 | 0.004 | 0.013 | 0.027 | 0.120 |
| 25 | | Vadhi | 17 | 7.50 | 6.77 | 0.008 | 0.002 | 0.015 | 0.062 | 0.386 |
| 26 | | Khardi | 17 | 7.70 | 7.09 | 0.010 | 0.002 | 0.016 | 0.054 | 0.074 |
| 27 | | Vehaloli | 16 | 7.40 | 4.29 | 0.198 | 0.104 | 0.128 | 0.141 | 0.242 |

STUDY AREA LOCATION: THANE DISTRICT

Water quality in Vasai Creek at Kasheli, Dive Anjur, Kalher, Dive Kevani, Maljipada, Ghodbunder junction, Nagala villages were assessed in Thane district and results are given in Table 3 & 4. Figures 17-20 indicates the assessment of physical characteristics of waterbodies.

Fig16. Sampling location & source water body mapping of the Thane district in Maharashtra

Table 3. Physical characteristics of Thane district during in SWM season

| S. No. | Creek | Village | Depth (m) | | Current flow Average (ft/s) | Temp (°C) | Turbidity (NTU) |
|--------|-------------|-------------|-----------|-----|-----------------------------|-----------|-----------------|
| | | | HT | LT | | | |
| 1 | Vasai Creek | Kasheli | 4.5 | 4.0 | 2.00 | 29 | 38 |
| 2 | | Kasheli | 4.3 | 4.0 | 1.80 | 29 | 29 |
| 3 | | Dive Anjur | 4.0 | 3.5 | 0.40 | 30 | 33 |
| 4 | | Kalher | 3.8 | 3.7 | 1.10 | 32 | 24 |
| 5 | | Dive kevani | 1.5 | 1.0 | 0.00 | 32 | 22 |

| | | | | | | | |
|---|--|---------------------|-----|-----|------|----|----|
| 6 | | Maljipada | 5.2 | 1.5 | 0.60 | 30 | 38 |
| 7 | | Ghodbunder junction | 6.9 | 5.4 | 0.20 | 30 | 36 |
| 8 | | Nagala | 7.2 | 4.5 | 0.20 | 30 | 31 |

Table 4. Chemical and biological characteristics of Thane district during in SWM season

| S. No. | Creek | Village | Salinity (ppt) | pH | DO (mg/l) | NH ₃ (ppm) | NO ₂ (ppm) | NO ₃ (ppm) | PO ₄ (ppm) | Chlorophyll <i>a</i> (mg/m ³) |
|--------|-------------|---------------------|----------------|------|-----------|-----------------------|-----------------------|-----------------------|-----------------------|---|
| 1 | Vasai Creek | Kasheli | 9 | 7.10 | 1.62 | 0.008 | 0.003 | 0.015 | 0.142 | 0.542 |
| 2 | | Kasheli | 10 | 7.20 | 0.64 | 0.011 | 0.005 | 0.017 | 0.147 | 0.507 |
| 3 | | Dive Anjur | 7 | 7.10 | 0.94 | 0.030 | 0.004 | 0.019 | 0.393 | 0.788 |
| 4 | | Kalher | 10 | 6.80 | 2.63 | 0.012 | 0.004 | 0.008 | 0.165 | 0.322 |
| 5 | | Dive kevani | 10 | 7.20 | 3.64 | 0.021 | 0.002 | 0.014 | 0.177 | 0.218 |
| 6 | | Maljipada | 14 | 7.10 | 0.60 | 0.044 | 0.005 | 0.029 | 0.156 | 0.380 |
| 7 | | Ghodbunder junction | 15 | 7.20 | 2.87 | 0.028 | 0.002 | 0.026 | 0.030 | 0.162 |
| 8 | | Nagala | 13 | 7.30 | 3.26 | 0.036 | 0.008 | 0.027 | 0.149 | 0.308 |

Fig.17. Measurement of Vasai Creek and its surroundings in Kasheli village at Thane district Maharashtra

Fig.18. Measurement of Vasai Creek and its surroundings in Devi-Anjur village at Thane district Maharashtra

Fig.19. Measurement of Vasai Creek and its surroundings in Devi-Kevani village at Thane district Maharashtra

Fig.20. Measurement of Vasai Creek and its surroundings in Maljipada village at Thane district Maharashtra

STUDY AREA LOCATION: RAIGAD DISTRICT

Water quality in Patalaganga river, Amba River, Kurul creek, Kundalika creek, Rajapuri Creek, Savitri River, Kalinje covering villages Khopate, Khar Simadevi, Kalve, Urnoli, Rave, Bhal, Koliwada, Mothe Bhal, Tamsi (Boisar), Hashivare, Shrikichal, Borivedi, Kurul, Sonar Peth, Bhonang, Nidi, Navakhar Traf Umate, Kude, Dapoli, Karanjivira, Agrav (Revdanda), Gofan, Uchal, Pabre, Vashi, Mandad, Uchal, Kandane, Kandane kh, Mithagar, Nandale, Gholi Mohalla, Kalinje, Kurawade, Shrivardhan, Adi, Toradi, Pangol, Kudgaon, Owale, Warathi were assessed in Raigad district and results are given in Table 5 & 6. Figures 22-33 indicates the assessment of physical characteristics of waterbodies.

Fig21. Sampling location & source water body mapping of the Raigad district in Maharashtra

Fig.22. Characteristics of Karanja Creek and its surroundings in Khopate village at Raigad district

Fig.23. Characteristics of Patalaganga Creek and its surroundings in Rave village at Raigad district

Fig.24. Characteristics of Bhogwati River and its surroundings in Bhal village at Raigad district

Fig.25. Characteristics of Amba River and its surroundings in Shrikichal village at Raigad district

Fig.26. Characteristics of Kurul Creek and its surroundings in Kurul village at Raigad district

Fig.27 Characteristics of Kundalika Creek and its surroundings in Bongang village at Raigad district

Fig.28 Characteristics of Rajapuri Creek and its surroundings in Pabre village at Raigad district

Fig.29 Characteristics of Rajapuri Creek and its surroundings in Vashi village at Raigad district

Fig.30 Characteristics of Rajapuri Creek and its surroundings in Utchal village at Raigad district

Fig.31 Characteristics of Kalinje Creek and its surroundings in Kalinje village at Raigad district

Fig.32 Characteristics of Savitri River and its surroundings in Adi village at Raigad district

Fig.33 Characteristics of Savitri River and its surroundings in Kudgaon village at Raigad district

Table 5. Physical characteristics of Raigad district during in SWM season

| S. No. | Creek | Village | Depth (m) | Current flow Average | Temp (°C) | Turbidity (NTU) |
|--------|-------|---------|-----------|----------------------|-----------|-----------------|
|--------|-------|---------|-----------|----------------------|-----------|-----------------|

| | | | HT | LT | (ft/s) | | |
|----|------------------------------|------------------------------|-----------|-----|--------|------|----|
| 1 | Karanja Creek | Khopate | 2.5 | 1.2 | 0.20 | 30 | 22 |
| 2 | Patalaganga Creek | Khar Simadevi | 4.0 | 1.7 | 1.10 | 29 | 23 |
| 3 | | Kalve | 6.0 | 4.0 | 0.10 | 30 | 14 |
| 4 | | Urnoli | 5.0 | 3.0 | 0.70 | 30 | 26 |
| 5 | | Rave | 7.5 | 3.5 | 1.30 | 30 | 20 |
| 6 | | Bhogwati River(Koprol creek) | Bhal | 3.6 | 1.8 | 0.40 | 30 |
| 7 | Patalaganga Creek | Koliwada | 6.8 | 2.0 | 0.40 | 30 | 10 |
| 8 | | | 6.0 | 3.0 | 0.40 | 30 | 16 |
| 9 | | | 5.8 | 3.5 | 0.80 | 30 | 15 |
| 10 | Patalaganga Creek | | 3.1 | 0.4 | 0.60 | 30 | 16 |
| 11 | | | 2.2 | 0.5 | 1.30 | 30 | 21 |
| 12 | | Mothe Bhal | 3.2 | 2.0 | 0.80 | 30 | 10 |
| 13 | | Amba River | Hashiware | 3.6 | 2.5 | 0.40 | 30 |
| 14 | Amba River | Shrikichal | 5.0 | 3.0 | 0.50 | 31 | 15 |
| 15 | | Borivedi | 6.0 | 3.0 | 0.20 | 31 | 10 |
| 16 | | Kurul Creek | Kurul | 3.0 | 1.0 | 0.10 | 30 |
| 17 | Kurul Creek | Kurul | 2.5 | 0.5 | 0.20 | 30 | 17 |
| 18 | | Kurul | 3.0 | 1.0 | 0.40 | 30 | 21 |
| 19 | | Sonar Peth | 2.2 | 1.0 | 0.20 | 31 | 14 |
| 20 | | Kundalika Creek | Bongang | 2.3 | 0.5 | 0.00 | 31 |
| 21 | Bongang | | 9.0 | 2.5 | 2.10 | 30 | 10 |
| 22 | Nidi | | 9.8 | 3.0 | 2.40 | 31 | 17 |
| 23 | Navakhar Traf Umate | | 8.1 | 1.5 | 0.40 | 30 | 15 |
| 24 | Kude | | 7.2 | 2.0 | 0.90 | 30 | 16 |
| 25 | Dapoli | | 6.3 | 1.8 | 0.80 | 30 | 15 |
| 26 | Karanjivira | | 6.7 | 2.0 | 0.50 | 30 | 38 |
| 27 | Agrav | | 6.0 | 2.5 | 0.10 | 31 | 34 |
| 28 | Gofan | | 4.5 | 2.0 | 0.10 | 30 | 35 |
| 29 | Rajpuri Creek(Mandeer creek) | Pabre | 1.5 | 0.0 | 0.20 | 33 | 14 |
| 30 | | Vashi | 3.4 | 1.0 | 0.30 | 32 | 39 |
| 31 | | Mandad | 4.5 | 1.5 | 0.20 | 32 | 43 |
| 32 | | Uchal | 2.5 | 2.0 | 0.00 | 35 | 48 |
| 33 | | Kandane | 4.5 | 2.0 | 0.40 | 32 | 55 |
| 34 | | Kandane kh | 4.8 | 1.5 | 0.60 | 32 | 62 |
| 35 | | Mithagar | 6.5 | 2.0 | 0.70 | 32 | 45 |
| 36 | | Nandale | 7.8 | 2.3 | 0.00 | 30 | 33 |
| 37 | Kalinje creek | Gholi Mohalla | 3.3 | 0.1 | 0.40 | 30 | 15 |
| 38 | | Kalinje | 2.2 | 0.1 | 0.40 | 29 | 20 |
| 39 | | Kalinje | 4.4 | 1.5 | 1.40 | 28 | 15 |
| 40 | | Kurawade | 2.2 | 0.8 | 1.10 | 28 | 19 |
| 41 | | Shrivardhan | 2.8 | 0.8 | 0.10 | 29 | 22 |
| 42 | Savitri River | Adi | 4.5 | 2.5 | 0.70 | 30 | 12 |
| 43 | | Toradi | 8.0 | 5.0 | 2.40 | 31 | 22 |
| 44 | | Pangalol | 7.0 | 4.0 | 1.70 | 30 | 30 |
| 45 | | Kudgaon | 6.0 | 3.0 | 0.30 | 29 | 44 |
| 46 | | Owale | 10.0 | 4.0 | 0.20 | 30 | 52 |
| 47 | | Warathi | 12.0 | 7.0 | 0.40 | 29 | 38 |

Table 6. Chemical and biological characteristics of Raigad district during in SWM season

| S. No. | Creek | Village | Salinity (ppt) | pH | DO (mg/l) | NH ₃ (ppm) | NO ₂ (ppm) | NO ₃ (ppm) | PO ₄ (ppm) | Chlorophyll <i>a</i> (mg/m ³) |
|--------|-------------------|------------------------------|----------------|------|-----------|-----------------------|-----------------------|-----------------------|-----------------------|---|
| 1 | Karanja Creek | Khopate | 24 | 7.50 | 6.60 | 0.006 | 0.006 | 0.013 | 0.029 | 0.302 |
| 2 | Patalaganga Creek | Khar Simadevi | 15 | 7.50 | 5.71 | 0.007 | 0.010 | 0.014 | 0.064 | 0.224 |
| 3 | | Kalve | 7 | 7.20 | 4.70 | 0.009 | 0.002 | 0.012 | 0.065 | 0.136 |
| 4 | | Urnoli | 14 | 7.40 | 5.16 | 0.008 | 0.003 | 0.013 | 0.060 | 0.254 |
| 5 | | Rave | 3 | 7.50 | 4.89 | 0.009 | 0.004 | 0.015 | 0.090 | 0.198 |
| 6 | | Bhogwati River(Koprol creek) | Bhal | 20 | 7.50 | 4.45 | 0.008 | 0.003 | 0.015 | 0.051 |
| 7 | Patalaganga Creek | Koliwada | 15 | 7.50 | 5.87 | 0.007 | 0.002 | 0.017 | 0.049 | 0.104 |
| 8 | | | 24 | 7.50 | 5.36 | 0.005 | 0.002 | 0.014 | 0.041 | 0.162 |
| 9 | | | 30 | 7.50 | 5.63 | 0.007 | 0.003 | 0.012 | 0.020 | 0.294 |
| 10 | | | 31 | 7.50 | 6.47 | 0.007 | 0.002 | 0.015 | 0.018 | 0.262 |
| 11 | Patalaganga Creek | | 25 | 7.50 | 7.05 | 0.011 | 0.002 | 0.017 | 0.035 | 0.311 |
| 12 | | Mothe Bhal | 30 | 7.50 | 5.70 | 0.006 | 0.003 | 0.014 | 0.042 | 0.359 |
| 13 | Amba River | Hashiware | 28 | 7.40 | 5.01 | 0.009 | 0.003 | 0.016 | 0.068 | 0.168 |
| 14 | | Shrikichal | 26 | 7.40 | 5.55 | 0.016 | 0.006 | 0.020 | 0.306 | 0.146 |
| 15 | | Borivedi | 24 | 7.40 | 6.39 | 0.019 | 0.021 | 0.024 | 0.299 | 0.296 |
| 16 | Kurul Creek | Kurul | 32 | 7.50 | 6.08 | 0.005 | 0.003 | 0.013 | 0.035 | 0.362 |
| 17 | | Kurul | 31 | 7.40 | 5.95 | 0.012 | 0.001 | 0.018 | 0.044 | 0.371 |
| 18 | | Kurul | 32 | 7.50 | 6.17 | 0.009 | 0.002 | 0.016 | 0.013 | 0.404 |
| 19 | | Sonar Peth | 22 | 7.40 | 6.29 | 0.012 | 0.004 | 0.018 | 0.059 | 0.335 |
| 20 | Kundalika Creek | Bongang | 25 | 7.40 | 5.04 | 0.004 | 0.001 | 0.013 | 0.050 | 0.250 |
| 21 | | Bongang | 33 | 7.50 | 6.66 | 0.007 | 0.002 | 0.015 | 0.017 | 0.301 |
| 22 | | Nidi | 30 | 7.50 | 6.90 | 0.006 | 0.003 | 0.014 | 0.022 | 0.468 |
| 23 | | Navakhar Traf Umate | 25 | 7.40 | 5.71 | 0.027 | 0.002 | 0.025 | 0.061 | 0.244 |
| 24 | | Kude | 19 | 7.30 | 4.88 | 0.076 | 0.002 | 0.050 | 0.061 | 0.160 |
| 25 | | Dapoli | 17 | 7.30 | 4.48 | 0.004 | 0.004 | 0.014 | 0.064 | 0.151 |
| 26 | | Karanjivira | 11 | 7.20 | 4.20 | 0.006 | 0.002 | 0.014 | 0.078 | 0.076 |
| 27 | | Agrav | 30 | 7.40 | 6.07 | 0.002 | 0.003 | 0.011 | 0.061 | 0.243 |
| 28 | | Gofan | 2 | 7.20 | 4.42 | 0.009 | 0.028 | 0.016 | 0.025 | 0.276 |
| 29 | | Rajpuri Creek(Mander creek) | Pabre | 20 | 7.40 | 5.99 | 0.020 | 0.002 | 0.018 | 0.030 |
| 30 | Vashi | | 32 | 7.50 | 6.45 | 0.024 | 0.003 | 0.020 | 0.120 | 0.145 |
| 31 | Mandad | | 26 | 7.40 | 6.00 | 0.013 | 0.002 | 0.018 | 0.049 | 0.426 |
| 32 | Uchal | | 7 | 7.50 | 7.28 | 0.008 | 0.001 | 0.015 | 0.071 | 0.124 |
| 33 | Kandane | | 11 | 7.50 | 6.77 | 0.007 | 0.004 | 0.014 | 0.055 | 0.188 |
| 34 | Kandane kh | | 15 | 7.60 | 6.68 | 0.051 | 0.005 | 0.033 | 0.044 | 0.241 |
| 35 | Mithagar | | 32 | 7.40 | 6.48 | 0.008 | 0.003 | 0.013 | 0.020 | 0.252 |
| 36 | Nandale | | 33 | 7.40 | 5.46 | 0.017 | 0.004 | 0.022 | 0.028 | 0.123 |
| 37 | Kalinje creek | Gholi | 27 | 7.50 | 5.01 | 0.055 | 0.002 | 0.046 | 0.028 | 0.148 |

| | | | | | | | | | | |
|----|---------------|-------------|----|------|------|-------|-------|-------|-------|-------|
| | | Mohalla | | | | | | | | |
| 38 | | Kalinje | 33 | 7.40 | 4.66 | 0.001 | 0.003 | 0.010 | 0.034 | 0.203 |
| 39 | | Kalinje | 33 | 7.50 | 4.82 | 0.015 | 0.000 | 0.017 | 0.031 | 0.074 |
| 40 | | Kurawade | 34 | 7.60 | 4.77 | 0.007 | 0.006 | 0.015 | 0.032 | 0.185 |
| 41 | | Shrivardhan | 33 | 7.60 | 5.40 | 0.006 | 0.002 | 0.014 | 0.022 | 0.217 |
| 42 | Savitri River | Adi | 27 | 7.30 | 5.04 | 0.015 | 0.003 | 0.020 | 0.068 | 0.121 |
| 43 | | Toradi | 20 | 7.30 | 4.74 | 0.001 | 0.001 | 0.012 | 0.045 | 0.218 |
| 44 | | Pangalol | 20 | 7.20 | 5.70 | 0.011 | 0.008 | 0.017 | 0.044 | 0.300 |
| 45 | | Kudgaon | 17 | 7.30 | 6.08 | 0.001 | 0.002 | 0.010 | 0.041 | 0.198 |
| 46 | | Owale | 4 | 7.80 | 8.59 | 0.089 | 0.003 | 0.058 | 0.065 | 0.098 |
| 47 | | Warathi | 5 | 7.80 | 8.70 | 0.010 | 0.001 | 0.016 | 0.028 | 0.139 |

STUDY AREA LOCATION: RATNAGIRI DISTRICT

Water quality in Savitri River, Kelshi creek, Wadi creek, Murdi creek, Vashishti River, Jaigad River, Kasarveli creek, Kajali River, Muchkundi River, Agarwadi creek, Pangeri creek, Vahgotan River covering villages Mhapral, Peve, Bakmental, Velas, Kelshi, Ade, Ade Wadi,

Anjarle, Murdi, Kongale, Nowsha, Umberghar, Bophan, Pangari, Songaon, Maldoli, Gangrai, Donavali, Cheveli Bundar, Waghivare Bordi, Parchuri, Karul, Kudli, Saitavadi, Thavasal, Kasari, Gadnaral, Kolisare, Chighalewadi, Voraiyuvdi, Sadye, Maiyekarwadi, Kasarveli, Majgaon, Shirgaon, Nachane, Sowmeshwar, Phanshop, Dorle, Dhadi, Dabhil Ambere, Muslimwadi, Purnagad, Bajarwadi, Jaithapur, Agarwadi, Waghran, Karel, Padve, Ansure Pangera, Maisasurwadi, Ansure Aadi, Ansure Danda, Pavevadi, Chisbundar, Sagve, Kasarveli, Saitvadi, Phansop, Purnagad, Agarwadi, Ansur, Amberi were assessed in Ratnagiri district and results are given in Table 7 & 8. Figures 35-50 indicates the assessment of physical characteristics of waterbodies.

Fig.34 Sampling location & source water body mapping of the Ratnagiri district in Maharashtra

Fig.35 Characteristics of Savitri River and its surroundings in Mhapral village at Ratnagiri district

Fig.36 Characteristics of Savitri River and its surroundings in Bakmental village at Ratnagiri district

Fig.37 Characteristics of Velas Creek and its surroundings in Velas village at Ratnagiri district

Fig.38 Characteristics of Kelshi Creek and its surroundings in Kelshi village at Ratnagiri district

Fig.39 Characteristics of Ade Creek and its surroundings in Ade village at Ratnagiri district

Fig.40 Characteristics of Murdi Creek and its surroundings in Anjarle village at Ratnagiri district

Fig.41 Characteristics of Vashishti River and its surroundings in Gangrai village at Ratnagiri district

Fig.42 Characteristics of Vashishti River and its surroundings in Waghivare Bordi village at Ratnagiri district

Fig.43 Assessment of Jaigad River and its surroundings in Kasari village at Ratnagiri district

Fig.44 Assessment of Voraiyuvdi Creek and its surroundings in Voraiyuvdi village at Ratnagiri district

Fig.45 Assessment of Kasarveli Creek and its surroundings in Kasarveli village at Ratnagiri district

Fig. 46 Assessment of Kajali River and its surroundings in Phanshop village at Ratnagiri district

Fig. 47 Assessment of Muchkundi River and its surroundings in Purnagad village at Ratnagiri district

Fig. 48 Assessment of Agarwadi Creek and its surroundings in Jaithapur village at Ratnagiri district

Fig.49 Assessment of Pangera Creek and its surroundings in Ansure Pangera village at Ratnagiri district

Fig. 50 Assessment of Vahgotan River and its surroundings in Sagve village at Ratnagiri district

Table 7. Physical characteristics of Ratnagiri district during in SWM season

| S. No. | Creek | Village | Depth (m) | | Current flow Average (ft/s) | Temp (°C) | Turbidity (NTU) |
|--------|-----------------|-----------------|-----------|-----|-----------------------------|-----------|-----------------|
| | | | HT | LT | | | |
| 1 | Savitri River | Mhapral | 14.0 | 8.0 | 0.20 | 31 | 15 |
| 2 | | Peve | 6.8 | 2.7 | 0.30 | 31 | 13 |
| 3 | | Bakmental | 6.0 | 3.5 | 0.20 | 30 | 10 |
| 4 | Velas Creek | Velas | 2.5 | 0.5 | 0.00 | 32 | 15 |
| 5 | | Velas | 1.0 | 0.5 | 0.00 | 33 | 8 |
| 6 | Kelshi Creek | Kelshi | 1.5 | 0.3 | 0.00 | 32 | 16 |
| 7 | | Kelshi | 2.5 | 1.0 | 0.60 | 33 | 26 |
| 8 | | Kelshi | 3.5 | 1.0 | 0.10 | 31 | 32 |
| 9 | Wadi Creek | Ade | 2.2 | 0.8 | 0.10 | 31 | 31 |
| 10 | | Ade Wadi | 1.8 | 0.3 | 0.20 | 31 | 44 |
| 11 | Murdi Creek | Anjarle | 3.0 | 0.2 | 0.00 | 30 | 39 |
| 12 | | Murdi | 4.5 | 1.5 | 0.10 | 30 | 22 |
| 13 | | Kongale | 2.5 | 0.7 | 0.20 | 30 | 16 |
| 14 | Vashishti River | Nowsha | 4.8 | 3.0 | 0.10 | 29 | 11 |
| 15 | | Umberghar | 4.5 | 2.0 | 0.40 | 29 | 5 |
| 16 | | Bophan | 5.0 | 3.0 | 1.10 | 29 | 7 |
| 17 | | Pangari | 5.5 | 2.5 | 0.60 | 31 | 10 |
| 18 | | Songaon | 5.8 | 4.2 | 0.00 | 31 | 18 |
| 19 | | Maldoli | 10.0 | 7.0 | 0.20 | 31 | 14 |
| 20 | | Gangrai | 11.0 | 8.0 | 0.00 | 31 | 11 |
| 21 | | Donavali | 11.0 | 5.0 | 0.40 | 32 | 26 |
| 22 | | Cheveli Bundar | 7.0 | 2.8 | 0.40 | 31 | 21 |
| 23 | | Waghivare Bordi | 12.0 | 5.0 | 0.70 | 27 | 64 |
| 24 | | Parchuri | 9.0 | 6.0 | 0.00 | 30 | 50 |
| 25 | | Karul | 8.0 | 3.0 | 0.10 | 30 | 48 |
| 26 | Jaigad River | Kudli | 8.6 | 4.0 | 0.20 | 32 | 10 |
| 27 | | Saitavadi | 10.4 | 6.2 | 0.20 | 31 | 12 |
| 28 | | Thavasal | 10.8 | 6.5 | 0.30 | 30 | 16 |
| 29 | | Kasari | 2.8 | 1.5 | 0.20 | 31 | 18 |
| 30 | | Gadnaral | 5.4 | 2.5 | 0.50 | 32 | 22 |

| | | | | | | | |
|----|--|--------------|------|-----|------|----|----|
| 31 | | Kolisare | 15.8 | 8.0 | 0.60 | 32 | 19 |
| 32 | | Chighalewadi | 12.9 | 7.0 | 0.80 | 33 | 39 |

(Conti.....)

| S. No. | Creek | Village | Depth (m) | | Current flow Average (ft/s) | Temp (°C) | Turbidity (NTU) |
|--------|------------------|----------------|-----------|-----|-----------------------------|-----------|-----------------|
| | | | HT | LT | | | |
| 33 | Voraiyuvdi Creek | Voraiyuvdi | 2.5 | 0.2 | 0.00 | 30 | 42 |
| 34 | Bholewadi Creek | Sadye | 1.5 | 0.1 | 0.00 | 31 | 43 |
| 35 | Kasarveli Creek | Maiyekarwadi | 2.0 | 1.0 | 0.00 | 32 | 51 |
| 36 | | Kasarveli | 2.2 | 0.5 | 0.00 | 30 | 13 |
| 37 | | Majgaon | 1.5 | 0.3 | 0.00 | 32 | 11 |
| 38 | | Shirgaon | 2.0 | 1.0 | 0.20 | 32 | 22 |
| 39 | Kajali River | Nachane | 4.0 | 2.0 | 0.20 | 32 | 10 |
| 40 | | Sowmeshwar | 2.0 | 1.0 | 0.00 | 32 | 15 |
| 41 | | Phanshop | 3.0 | 1.0 | 0.10 | 31 | 28 |
| 42 | | Dorle | 3.0 | 1.0 | 0.20 | 31 | 30 |
| 43 | Muchkundi River | Dorle | 2.0 | 0.3 | 0.00 | 29 | 43 |
| 44 | | Dhadi | 3.0 | 1.5 | 0.00 | 30 | 17 |
| 45 | | Dabhil Ambere | 4.0 | 2.0 | 0.10 | 31 | 13 |
| 46 | | Muslimwadi | 2.3 | 1.2 | 0.10 | 34 | 15 |
| 47 | | Purnagad | 2.5 | 0.2 | 0.20 | 32 | 19 |
| 48 | Agarwadi Creek | Bajarwadi | 1.7 | 1.0 | 0.20 | 33 | 10 |
| 49 | | Jaithapur | 1.5 | 0.5 | 0.30 | 31 | 15 |
| 50 | | Agarwadi | 3.5 | 1.5 | 0.20 | 32 | 21 |
| 51 | | Waghran | 1.5 | 0.5 | 0.00 | 31 | 15 |
| 52 | | Karel | 3.2 | 1.5 | 0.00 | 31 | 29 |
| 53 | | Padve | 8.5 | 2.5 | 0.00 | 31 | 24 |
| 54 | Pangera Creek | Ansure Pangera | 6.0 | 3.5 | 0.00 | 29 | 32 |
| 55 | | Maisasurwadi | 1.5 | 1.0 | 0.00 | 33 | 44 |
| 56 | | Ansure Aadi | 1.5 | 0.1 | 0.30 | 33 | 53 |
| 57 | | Ansure Danda | 2.2 | 0.5 | 0.00 | 31 | 64 |
| 58 | Vahghotan River | Pavevadi | 1.5 | 0.5 | 0.00 | 32 | 59 |
| 59 | | Chisbundar | 3.0 | 1.0 | 0.00 | 29 | 13 |
| 60 | | Sagve | 4.0 | 2.0 | 0.10 | 30 | 18 |

Table 8. Chemical and biological characteristics of Ratnagiri district during in SWM season

| S. No. | Creek | Village | Salinity (ppt) | pH | DO (mg/l) | NH ₃ (ppm) | NO ₂ (ppm) | NO ₃ (ppm) | PO ₄ (ppm) | Chlorophyll a (mg/m ³) |
|--------|-----------------|-----------------|----------------|------|-----------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------------------|
| 1 | Savitri River | Mhapral | 10 | 7.20 | 6.49 | 0.002 | 0.003 | 0.011 | 0.024 | 0.147 |
| 2 | | Peve | 14 | 7.30 | 5.64 | 0.004 | 0.002 | 0.012 | 0.032 | 0.127 |
| 3 | | Bakmental | 35 | 7.50 | 6.31 | 0.008 | 0.001 | 0.015 | 0.033 | 0.099 |
| 4 | Velas Creek | Velas | 5 | 7.40 | 6.30 | 0.107 | 0.002 | 0.069 | 0.053 | 0.152 |
| 5 | | Velas | 3 | 7.30 | 6.97 | 0.007 | 0.001 | 0.015 | 0.057 | 0.075 |
| 6 | Kelshi Creek | Kelshi | 1 | 7.40 | 6.53 | 0.005 | 0.001 | 0.012 | 0.045 | 0.156 |
| 7 | | Kelshi | 1 | 7.40 | 6.72 | 0.002 | 0.001 | 0.011 | 0.051 | 0.060 |
| 8 | | Kelshi | 14 | 7.50 | 6.42 | 0.002 | 0.003 | 0.013 | 0.048 | 0.218 |
| 9 | Wadi Creek | Ade | 15 | 7.40 | 6.56 | 0.021 | 0.003 | 0.014 | 0.033 | 0.211 |
| 10 | | Ade Wadi | 0 | 7.50 | 6.36 | 0.047 | 0.001 | 0.030 | 0.036 | 0.173 |
| 11 | Murdi Creek | Anjarle | 26 | 7.20 | 3.73 | 0.009 | 0.002 | 0.016 | 0.038 | 0.163 |
| 12 | | Murdi | 12 | 7.30 | 6.90 | 0.049 | 0.003 | 0.032 | 0.052 | 0.215 |
| 13 | | Kongale | 7 | 7.50 | 7.30 | 0.052 | 0.004 | 0.040 | 0.043 | 0.160 |
| 14 | Vashishti River | Nowsha | 21 | 7.40 | 6.19 | 0.022 | 0.002 | 0.018 | 0.038 | 0.313 |
| 15 | | Umberghar | 12 | 7.70 | 5.98 | 0.001 | 0.004 | 0.012 | 0.042 | 0.048 |
| 16 | | Bophan | 13 | 7.67 | 6.14 | 0.008 | 0.001 | 0.014 | 0.059 | 0.073 |
| 17 | | Pangari | 13 | 7.63 | 5.84 | 0.026 | 0.002 | 0.019 | 0.046 | 0.100 |
| 18 | | Songaon | 0 | 6.79 | 7.78 | 0.019 | 0.003 | 0.014 | 0.030 | 0.175 |
| 19 | | Maldoli | 1 | 7.30 | 7.59 | 0.026 | 0.001 | 0.038 | 0.027 | 0.135 |
| 20 | | Gangrai | 3 | 7.21 | 6.17 | 0.030 | 0.002 | 0.037 | 0.032 | 0.106 |
| 21 | | Donavali | 2 | 7.29 | 7.06 | 0.022 | 0.002 | 0.070 | 0.030 | 0.262 |
| 22 | | Cheveli Bundar | 3 | 7.27 | 6.89 | 0.026 | 0.002 | 0.048 | 0.031 | 0.211 |
| 23 | | Waghivare Bordi | 3 | 7.85 | 6.93 | 0.010 | 0.002 | 0.042 | 0.026 | 0.239 |
| 24 | | Parchuri | 2 | 7.74 | 6.69 | 0.026 | 0.003 | 0.053 | 0.040 | 0.133 |
| 25 | Karul | 12 | 7.99 | 6.06 | 0.012 | 0.003 | 0.076 | 0.041 | 0.214 | |
| 26 | Jaigad River | Kudli | 10 | 8.03 | 6.46 | 0.057 | 0.002 | 0.029 | 0.039 | 0.101 |
| 27 | | Saitavadi | 20 | 7.66 | 6.93 | 0.025 | 0.001 | 0.015 | 0.040 | 0.072 |
| 28 | | Thavasal | 32 | 8.20 | 5.67 | 0.036 | 0.002 | 0.037 | 0.055 | 0.070 |

| | | | | | | | | | | |
|----|--|------------------|----|------|------|-------|-------|-------|-------|-------|
| 29 | | Kasari | 29 | 8.20 | 5.90 | 0.001 | 0.001 | 0.035 | 0.038 | 0.171 |
| 30 | | Gadnaral | 15 | 8.01 | 6.35 | 0.002 | 0.002 | 0.020 | 0.034 | 0.256 |
| 31 | | Kolisare | 9 | 8.03 | 7.03 | 0.021 | 0.002 | 0.019 | 0.042 | 0.092 |
| 32 | | Chighalew adi | 12 | 8.01 | 7.01 | 0.063 | 0.002 | 0.015 | 0.036 | 0.158 |

(Conti.....)

| S. No. | Creek | Village | Salinity (ppt) | pH | DO (mg/l) | NH ₃ (Ppm) | NO ₂ (ppm) | NO ₃ (ppm) | PO ₄ (ppm) | Chlorophyll a (mg/m ³) |
|--------|------------------|----------------|----------------|------|-----------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------------------|
| 33 | Voraiyuvdi Creek | Voraiyuvdi | 21 | 8.04 | 5.17 | 0.301 | 0.002 | 0.088 | 0.061 | 0.052 |
| 34 | Bholewadi Creek | Sadye | 5 | 7.92 | 7.40 | 0.013 | 0.001 | 0.018 | 0.058 | 0.094 |
| 35 | Kasarveli Creek | Maiyekarwadi | 24 | 8.34 | 5.08 | 0.090 | 0.005 | 0.049 | 0.049 | 0.064 |
| 36 | | Kasarveli | 32 | 8.28 | 5.25 | 0.065 | 0.001 | 0.026 | 0.038 | 0.127 |
| 37 | | Majgaon | 26 | 8.05 | 5.55 | 0.007 | 0.002 | 0.025 | 0.036 | 0.070 |
| 38 | | Shirgaon | 33 | 8.28 | 6.79 | 0.002 | 0.006 | 0.029 | 0.029 | 0.223 |
| 39 | Kajali River | Nachane | 5 | 7.97 | 7.83 | 0.146 | 0.002 | 0.040 | 0.033 | 0.101 |
| 40 | | Sowmeshwar | 4 | 8.10 | 7.35 | 0.039 | 0.003 | 0.027 | 0.037 | 0.153 |
| 41 | | Phanshop | 20 | 8.25 | 7.43 | 0.086 | 0.003 | 0.026 | 0.034 | 0.282 |
| 42 | | Dorle | 5 | 8.12 | 7.47 | 0.033 | 0.003 | 0.033 | 0.029 | 0.303 |
| 43 | Muchkundi River | Dorle | 5 | 8.11 | 7.27 | 0.012 | 0.002 | 0.029 | 0.058 | 0.197 |
| 44 | | Dhadi | 0 | 7.61 | 7.35 | 0.050 | 0.002 | 0.030 | 0.040 | 0.170 |
| 45 | | Dabhil Ambere | 12 | 8.10 | 7.01 | 0.020 | 0.003 | 0.026 | 0.043 | 0.325 |
| 46 | | Muslimwadi | 28 | 8.00 | 6.56 | 0.021 | 0.004 | 0.026 | 0.042 | 0.147 |
| 47 | | Purnagad | 17 | 7.76 | 6.40 | 0.021 | 0.006 | 0.043 | 0.055 | 0.188 |
| 48 | Agarwadi Creek | Bajarwadi | 14 | 7.64 | 7.00 | 0.178 | 0.003 | 0.033 | 0.029 | 0.098 |
| 49 | | Jaithapur | 20 | 8.25 | 6.46 | 0.037 | 0.004 | 0.049 | 0.028 | 0.152 |
| 50 | | Agarwadi | 15 | 8.13 | 6.23 | 0.139 | 0.003 | 0.033 | 0.043 | 0.213 |
| 51 | | Waghran | 7 | 7.99 | 6.93 | 0.152 | 0.003 | 0.040 | 0.051 | 0.152 |
| 52 | | Karel | 4 | 7.36 | 8.03 | 0.164 | 0.001 | 0.117 | 0.039 | 0.287 |
| 53 | | Padve | 1 | 7.70 | 7.83 | 0.123 | 0.001 | 0.034 | 0.044 | 0.234 |
| 54 | Pangera Creek | Ansure Pangera | 34 | 7.48 | 5.01 | 0.032 | 0.003 | 0.038 | 0.042 | 0.115 |
| 55 | | Maisasurwadi | 23 | 7.41 | 7.08 | 0.095 | 0.003 | 0.032 | 0.038 | 0.412 |
| 56 | | Ansure Aadi | 24 | 7.28 | 5.40 | 0.020 | 0.002 | 0.026 | 0.037 | 0.230 |

| | | | | | | | | | | |
|----|--------------------|--------------|----|------|------|-------|-------|-------|-------|-------|
| 57 | | Ansure Danda | 26 | 7.43 | 5.67 | 0.178 | 0.005 | 0.100 | 0.036 | 0.143 |
| 58 | Vahghotan River | Pavevadi | 25 | 7.32 | 5.64 | 0.023 | 0.005 | 0.032 | 0.042 | 0.086 |
| 59 | | Chisbundar | 34 | 7.70 | 5.28 | 0.018 | 0.012 | 0.035 | 0.046 | 0.129 |
| 60 | | Sagve | 26 | 7.61 | 5.42 | 0.002 | 0.032 | 0.012 | 0.061 | 0.184 |

STUDY AREA LOCVAION: SINDHUDURG DISTRICT

Water quality in Vahghotan River, Devgad River, Taramumbari Creek, Naringre River, Gad River, Achara Creek, Munge Creek, Karali River, Shriramwadi Creek, Mandavi River, Mochimad River, Tiroda Creek, covering villages Tirlot, Padel, Girye, Thakulwadi, Amberi, Wadaker Poi, Waghotan, Mutat, Palekarwadi, Mond, Tembavil, Kalvi, Katta, Biruwadi, Darwadi, Malai, Warandwadi, Mithmumbari, Belwadi, Mithmumbari, Tharamumbari, Elaye, Khakshi, Tambaldeg, Morve, Hindale, Girawal, Kothewada, Govkarwada, Pankhol, Tondavali, Thalashil, Khot Juva, Gaudwadi, Jamdul, Achara Bandar, Dogrewadi, Parwadi, Chindar Labdewadi, Munge, Masure, Chipi, Chipi Juva, Thevili, Devbaug, Waghavane, Mayne, Niviti, Parule, Karli, Revandi, Dhamapur, Kalse&Walaval, Nerur, Sarambal, Dabhoswada, Namas, Mochimad, Mochimad Ansure, Tank, Shiroda Keruwadi and Huda were assessed in sindhadurg district and results are given in Table 9 & 10. Figures 52-63 indicates the assessment of physical characteristics of waterbodies.

Fig.51 Sampling location & source water body mapping of the Sindhudurg district in Maharashtra

Fig. 52 Assessment of Vahgotan River and its surroundings in Tirlot village at Sindhudurg district

Fig. 53 Assessment of Devgad River and its surroundings in Mond village at Sindhudurg district

Fig. 54 Measurement of Taramumbari Creek and its surroundings in Taramumbari village at Sindhudurg district

Fig. 55 Measurement of Naringre River and its surroundings in Tambaldeg village at Sindhudurg district

Fig. 56 Measurement of God River and its surroundings in Juve Pankhol village at Sindhudurg district

Fig. 57 Measurement of Achara Creek and its surroundings in Achara Bandar village at Sindhudurg district

Fig. 58 Measurement of Munge Creek and its surroundings in Munge village at Sindhudurg district

Fig. 59 Measurement of Karali River and its surroundings in Chipi Juva village at Sindhudurg district

Fig. 60 Measurement of Shriramwadi Creek and its surroundings in Mayne village at Sindhudurg district

Fig. 61 Measurement of Mandavi River and its surroundings in Vengurla village at Sindhudurg district

Fig. 62 Measurement of Mochimad River and its surroundings in Mochimad Ansure village at Sindhudurg district

Fig. 63 Measurement of Tiroda Creek and its surroundings in Shiroda Keruwadi village at Sindhudurg district

Table 9. Physical characteristics of Sindhudurg district during in SWM season

| S. No. | Creek | Village | Depth (m) | | Current flow Average (ft/s) | Temp (°C) | Turbidity (NTU) |
|--------|-------------------|--------------|-----------|-----|-----------------------------|-----------|-----------------|
| | | | HT | LT | | | |
| 1 | Vahgotan River | Tirlot | 1.5 | 0.5 | 0.00 | 35 | 43 |
| 2 | | Padel | 1.5 | 0.5 | 0.00 | 34 | 48 |
| 3 | | Girye | 1.5 | 0.5 | 0.20 | 32 | 53 |
| 4 | | Girye | 3.0 | 1.5 | 0.40 | 30 | 18 |
| 5 | | Thakulwadi | 5.7 | 3.5 | 0.20 | 30 | 10 |
| 6 | | Amberi | 7.2 | 4.0 | 0.10 | 31 | 13 |
| 7 | | Wadaker Poi | 3.6 | 2.0 | 0.10 | 31 | 11 |
| 8 | | Waghotan | 3.6 | 2.0 | 0.20 | 31 | 8 |
| 9 | | Mutat | 2.5 | 1.0 | 0.20 | 30 | 14 |
| 10 | | Palekarwadi | 3.5 | 2.0 | 1.00 | 32 | 10 |
| 11 | Devgad River | Mond | 1.5 | 0.5 | 0.10 | 31 | 14 |
| 12 | | Tembavil | 4.0 | 0.5 | 0.40 | 31 | 18 |
| 13 | | Kalvi | 4.0 | 2.5 | 0.40 | 31 | 33 |
| 14 | | Katta | 3.5 | 2.0 | 0.00 | 31 | 41 |
| 15 | | Biruwadi | 4.0 | 2.0 | 0.20 | 30 | 13 |
| 16 | | Darwadi | 1.5 | 2.0 | 0.20 | 30 | 20 |
| 17 | | Malai | 3.5 | 2.0 | 0.00 | 29 | 18 |
| 18 | Taramumbari Creek | Warandwadi | 1.5 | 0.5 | 0.00 | 30 | 32 |
| 19 | | Mithmumbari | 4.0 | 1.5 | 0.20 | 29 | 10 |
| 20 | | Belwadi | 3.8 | 2.0 | 0.60 | 29 | 6 |
| 21 | | Mithmumbari | 4.5 | 2.5 | 0.60 | 30 | 12 |
| 22 | | Tharamumbari | 1.5 | 0.0 | 0.30 | 30 | 8 |
| 23 | | Elaye | 2.5 | 1.0 | 0.00 | 31 | 7 |
| 24 | | Khakshi | 1.0 | 0.0 | 0.00 | 31 | 17 |
| 25 | Naringre River | Tambaldeg | 3.5 | 2.5 | 0.20 | 31 | 44 |
| 26 | | Tambaldeg | 2.8 | 1.5 | 0.20 | 31 | 44 |
| 27 | | Tambaldeg | 1.5 | 0.9 | 0.00 | 32 | 58 |
| 28 | | Morve | 2.5 | 1.0 | 0.20 | 31 | 48 |
| 29 | | Hindale | 2.0 | 0.5 | 0.00 | 29 | 18 |
| 30 | | Girawal | 1.5 | 0.1 | 0.00 | 30 | 18 |
| 31 | | Hindale | 2.0 | 0.5 | 0.00 | 30 | 19 |
| 32 | Gad River | Kothewada | 6.5 | 4.0 | 0.00 | 32 | 7 |
| 33 | | Govkarwada | 4.0 | 2.5 | 1.40 | 31 | 10 |
| 34 | | Kothewada | 4.0 | 2.0 | 0.40 | 30 | 9 |
| 35 | | Pankhol | 3.5 | 1.8 | 1.30 | 31 | 8 |
| 36 | | Pankhol | 3.0 | 1.8 | 0.80 | 31 | 13 |
| 37 | | Tondavali | 3.0 | 1.7 | 0.20 | 30 | 15 |
| 38 | | Thalashil | 3.5 | 2.0 | 0.00 | 32 | 35 |
| 39 | | Khot Juva | 3.5 | 2.0 | 0.00 | 30 | 44 |

(Conti.....)

| S. No. | Creek | Village | Depth (m) | | Current flow Average (ft/s) | Temp (°C) | Turbidity (NTU) |
|--------|---------------------------|----------------------|-----------|-----|-----------------------------|-----------|-----------------|
| | | | HT | LT | | | |
| 40 | Achara Creek | Gaudwadi | 2.1 | 0.2 | 0.00 | 30 | 14 |
| 41 | | Jamdul | 4.0 | 1.8 | 0.40 | 30 | 12 |
| 42 | | Achara Bandar | 5.5 | 2.5 | 0.40 | 29 | 10 |
| 43 | | Dogrewadi | 2.0 | 0.3 | 0.00 | 29 | 11 |
| 44 | | Parwadi | 3.8 | 1.5 | 0.00 | 29 | 8 |
| 45 | | Parwadi | 2.5 | 1.0 | 0.20 | 30 | 9 |
| 46 | | Parwadi | 1.7 | 0.5 | 0.00 | 30 | 10 |
| 47 | Gad River | Chindar Labdewadi | 3.5 | 2.0 | 1.30 | 32 | 13 |
| 48 | Munge Creek | Munge | 3.5 | 2.0 | 0.60 | 32 | 27 |
| 49 | Gad River | Masure | 4.5 | 2.5 | 0.20 | 31 | 29 |
| 50 | Karali River(Chipi creek) | Chipi | 4.0 | 2.0 | 0.40 | 29 | 10 |
| 51 | | Chipi Juva | 4.5 | 2.5 | 0.00 | 29 | 9 |
| 52 | | Thevili | 2.5 | 1.2 | 0.20 | 28 | 15 |
| 53 | | Devbaug | 3.2 | 2.0 | 0.50 | 29 | 14 |
| 54 | | Waghavane | 3.9 | 1.2 | 0.00 | 30 | 16 |
| 55 | Shriramwadi Creek | Mayne | 3.0 | 1.5 | 0.00 | 31 | 12 |
| 56 | | Niviti | 2.5 | 1.2 | 0.20 | 30 | 33 |
| 57 | Karali River(Chipi creek) | Parule | 3.5 | 2.0 | 0.00 | 29 | 30 |
| 58 | | Karli | 4.0 | 2.0 | 0.00 | 27 | 26 |
| 59 | Gad River | Revandi | 1.5 | 0.5 | 0.00 | 31 | 15 |
| 60 | Karali River(Chipi creek) | Dhamapur | 3.2 | 1.5 | 0.10 | 30 | 12 |
| 61 | | Kalse&Walaval | 4.0 | 2.0 | 0.10 | 31 | 11 |
| 62 | | Nerur | 3.6 | 1.8 | 0.10 | 31 | 20 |
| 63 | | Sarambal | 2.7 | 1.0 | 0.00 | 31 | 15 |
| 64 | Mandavi River | Dabhoswada(Vengurla) | 2.5 | 1.2 | 0.00 | 30 | 26 |
| 65 | | Namas (Vengurla) | 1.2 | 0.3 | 0.00 | 30 | 46 |
| 66 | Mochimad River | Mochimad | 4.0 | 2.7 | 0.00 | 31 | 52 |
| 67 | | Mochimad Ansure | 4.5 | 2.4 | 0.60 | 30 | 34 |
| 68 | | Tank | 4.8 | 2.6 | 0.00 | 30 | 48 |
| 69 | Tiroda Creek | Shiroda Keruwadi | 2.5 | 1.0 | 0.00 | 28 | 33 |
| 70 | | Huda | 2.0 | 0.7 | 0.00 | 30 | 28 |

Table 10. Chemical and biological characteristics of Sindhudurg district during in SWM season

| S. No | Creek | Village | Salinity (ppt) | pH | DO (mg/l) | NH ₃ (ppm) | NO ₂ (ppm) | NO ₃ (ppm) | PO ₄ (ppm) | Chlorophyll a (mg/m ³) |
|-------|-------------------|--------------|----------------|------|-----------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------------------|
| 1 | Vahghotan River | Tirlot | 23 | 7.18 | 6.16 | 0.055 | 0.004 | 0.051 | 0.043 | 0.126 |
| 2 | | Padel | 20 | 7.34 | 6.96 | 0.058 | 0.004 | 0.044 | 0.038 | 0.276 |
| 3 | | Giryee | 25 | 7.37 | 6.28 | 0.016 | 0.002 | 0.032 | 0.042 | 0.226 |
| 4 | | Giryee | 26 | 7.15 | 5.87 | 0.074 | 0.003 | 0.028 | 0.049 | 0.117 |
| 5 | | Thakulwadi | 28 | 7.51 | 5.73 | 0.004 | 0.032 | 0.025 | 0.032 | 0.103 |
| 6 | | Amberi | 22 | 7.31 | 6.16 | 0.037 | 0.002 | 0.020 | 0.055 | 0.080 |
| 7 | | Wadaker Poi | 16 | 7.64 | 6.33 | 0.062 | 0.002 | 0.018 | 0.044 | 0.109 |
| 8 | | Waghotan | 12 | 8.16 | 5.99 | 0.189 | 0.002 | 0.030 | 0.030 | 0.076 |
| 9 | | Mutat | 9 | 7.69 | 6.03 | 0.097 | 0.002 | 0.030 | 0.028 | 0.135 |
| 10 | | Palekarwadi | 2 | 7.50 | 7.38 | 0.018 | 0.003 | 0.023 | 0.028 | 0.076 |
| 11 | Devgad River | Mond | 5 | 7.51 | 7.18 | 0.098 | 0.008 | 0.041 | 0.034 | 0.135 |
| 12 | | Tembavil | 6 | 7.58 | 7.34 | 0.147 | 0.002 | 0.051 | 0.031 | 0.175 |
| 13 | | Kalvi | 10 | 7.58 | 7.54 | 0.014 | 0.002 | 0.020 | 0.032 | 0.330 |
| 14 | | Katta | 16 | 7.19 | 7.21 | 0.194 | 0.002 | 0.056 | 0.030 | 0.407 |
| 15 | | Biruwadi | 18 | 7.60 | 7.04 | 0.037 | 0.004 | 0.017 | 0.058 | 0.127 |
| 16 | | Darwadi | 24 | 7.73 | 6.62 | 0.008 | 0.002 | 0.028 | 0.045 | 0.197 |
| 17 | | Malai | 30 | 7.86 | 6.02 | 0.038 | 0.001 | 0.070 | 0.044 | 0.574 |
| 18 | Taramumbari Creek | Warandwadi | 35 | 7.81 | 5.83 | 0.026 | 0.003 | 0.057 | 0.041 | 0.315 |
| 19 | | Mithmumbari | 35 | 7.79 | 5.79 | 0.047 | 0.005 | 0.046 | 0.065 | 0.400 |
| 20 | | Belwadi | 35 | 7.75 | 5.71 | 0.029 | 0.003 | 0.047 | 0.028 | 0.077 |
| 21 | | Mithmumbari | 35 | 7.57 | 6.01 | 0.014 | 0.003 | 0.030 | 0.024 | 0.118 |
| 22 | | Tharamumbari | 35 | 7.48 | 5.88 | 0.005 | 0.008 | 0.030 | 0.032 | 0.078 |
| 23 | | Elaye | 25 | 7.64 | 5.22 | 0.085 | 0.003 | 0.046 | 0.033 | 0.072 |
| 24 | | Khakshi | 3 | 7.39 | 7.71 | 0.037 | 0.003 | 0.022 | 0.043 | 0.367 |
| 25 | Naringre River | Tambaldeg | 27 | 7.71 | 6.63 | 0.067 | 0.002 | 0.032 | 0.057 | 0.434 |
| 26 | | Tambaldeg | 28 | 7.77 | 6.76 | 0.067 | 0.005 | 0.038 | 0.045 | 0.437 |
| 27 | | Tambaldeg | 27 | 7.71 | 6.43 | 0.079 | 0.004 | 0.044 | 0.051 | 0.083 |
| 28 | | Morve | 26 | 7.60 | 6.86 | 0.065 | 0.007 | 0.051 | 0.048 | 0.079 |
| 29 | | Hindale | 25 | 7.63 | 6.71 | 0.102 | 0.016 | 0.057 | 0.033 | 0.180 |
| 30 | | Girawal | 20 | 7.74 | 5.76 | 0.140 | 0.019 | 0.053 | 0.036 | 0.180 |
| 31 | | Hindale | 16 | 7.83 | 5.85 | 0.139 | 0.021 | 0.043 | 0.038 | 0.190 |
| 32 | Gad River | Kothewada | 17 | 7.46 | 6.25 | 0.095 | 0.013 | 0.038 | 0.052 | 0.266 |
| 33 | | Govkarwada | 21 | 7.67 | 6.30 | 0.041 | 0.011 | 0.047 | 0.043 | 0.295 |
| 34 | | Kothewada | 20 | 7.64 | 6.51 | 0.144 | 0.016 | 0.067 | 0.038 | 0.285 |
| 35 | | Pankhol | 21 | 7.77 | 6.48 | 0.068 | 0.017 | 0.030 | 0.042 | 0.359 |
| 36 | | Pankhol | 17 | 7.06 | 6.63 | 0.108 | 0.014 | 0.029 | 0.049 | 0.751 |
| 37 | | Tondavali | 18 | 7.73 | 6.71 | 0.007 | 0.002 | 0.025 | 0.046 | 0.751 |
| 38 | | Thalashil | 16 | 7.73 | 6.58 | 0.123 | 0.013 | 0.089 | 0.032 | 0.691 |
| 39 | | Khot Juva | 8 | 7.72 | 7.05 | 0.033 | 0.010 | 0.028 | 0.055 | 0.608 |

(Conti.....)

| S. No. | Creek | Village | Salinity (ppt) | pH | DO (mg/l) | NH ₃ (ppm) | NO ₂ (ppm) | NO ₃ (ppm) | PO ₄ (ppm) | Chlorophyll <i>a</i> (mg/m ³) |
|--------|---------------------------|----------------------|----------------|------|-----------|-----------------------|-----------------------|-----------------------|-----------------------|---|
| 40 | Achara Creek | Gaudwadi | 33 | 7.42 | 6.41 | 0.032 | 0.009 | 0.052 | 0.044 | 0.578 |
| 41 | | Jamdul | 34 | 7.46 | 6.02 | 0.003 | 0.001 | 0.026 | 0.020 | 0.318 |
| 42 | | Achara Bandar | 34 | 7.68 | 6.14 | 0.004 | 0.002 | 0.033 | 0.028 | 0.294 |
| 43 | | Dogrewadi | 28 | 7.96 | 5.69 | 0.042 | 0.011 | 0.031 | 0.028 | 0.301 |
| 44 | | Parwadi | 27 | 7.68 | 5.85 | 0.034 | 0.011 | 0.028 | 0.034 | 0.306 |
| 45 | | Parwadi | 8 | 7.56 | 6.42 | 0.011 | 0.009 | 0.022 | 0.031 | 0.361 |
| 46 | | Parwadi | 4 | 7.43 | 6.92 | 0.002 | 0.001 | 0.024 | 0.032 | 0.329 |
| 47 | Gad River | Chindar Labdewadi | 10 | 7.36 | 6.36 | 0.003 | 0.001 | 0.023 | 0.022 | 0.428 |
| 48 | Munge Creek | Munge | 28 | 7.62 | 6.46 | 0.096 | 0.018 | 0.028 | 0.038 | 0.169 |
| 49 | Gad River | Masure | 1 | 7.35 | 7.76 | 0.063 | 0.011 | 0.034 | 0.045 | 0.191 |
| 50 | Karali River(Chipi creek) | Chipi | 16 | 7.62 | 6.51 | 0.150 | 0.026 | 0.032 | 0.044 | 0.300 |
| 51 | | Chipi Juva | 18 | 7.54 | 6.84 | 0.112 | 0.015 | 0.046 | 0.041 | 0.241 |
| 52 | | Thevili | 26 | 7.52 | 6.49 | 0.054 | 0.013 | 0.282 | 0.035 | 0.256 |
| 53 | | Devbaug | 17 | 7.55 | 6.78 | 0.034 | 0.007 | 0.059 | 0.028 | 0.195 |
| 54 | | Waghavane | 15 | 7.36 | 6.63 | 0.045 | 0.009 | 0.027 | 0.024 | 0.185 |
| 55 | Shriramwadi Creek | Mayne | 15 | 7.08 | 8.08 | 0.276 | 0.030 | 0.078 | 0.032 | 0.280 |
| 56 | | Niviti | 28 | 7.40 | 6.78 | 0.002 | 0.001 | 0.052 | 0.033 | 0.300 |
| 57 | Karali River(Chipi creek) | Parule | 13 | 7.61 | 6.17 | 0.085 | 0.008 | 0.072 | 0.053 | 0.336 |
| 58 | | Karli | 21 | 7.82 | 6.97 | 0.150 | 0.018 | 0.042 | 0.055 | 0.160 |
| 59 | Gad River | Revandi | 29 | 7.60 | 6.83 | 0.003 | 0.001 | 0.044 | 0.045 | 0.153 |
| 60 | Karali River(Chipi creek) | Dhamapur | 3 | 7.21 | 6.39 | 0.065 | 0.007 | 0.040 | 0.051 | 0.217 |
| 61 | | Kalse&Walaval | 1 | 6.89 | 7.07 | 0.047 | 0.006 | 0.081 | 0.048 | 0.145 |
| 62 | | Nerur | 0 | 7.27 | 6.99 | 0.105 | 0.012 | 0.082 | 0.033 | 0.243 |
| 63 | | Sarambal | 0 | 7.27 | 7.17 | 0.069 | 0.007 | 0.136 | 0.036 | 0.154 |
| 64 | Mandavi River | Dabhoswada(Vengurla) | 17 | 7.50 | 6.99 | 0.111 | 0.016 | 0.043 | 0.038 | 0.130 |
| 65 | | Namas (Vengurla) | 12 | 7.20 | 6.20 | 0.098 | 0.008 | 0.123 | 0.052 | 0.172 |
| 66 | Mochimad River | Mochimad | 27 | 7.43 | 6.61 | 0.003 | 0.001 | 0.034 | 0.043 | 0.250 |
| 67 | | Mochimad Ansure | 26 | 7.55 | 7.21 | 0.003 | 0.002 | 0.033 | 0.038 | 0.144 |
| 68 | | Tank | 21 | 7.49 | 6.27 | 0.052 | 0.008 | 0.035 | 0.042 | 0.181 |
| 69 | Tiroda Creek | Shiroda Keruwadi | 27 | 7.38 | 7.49 | 0.022 | 0.004 | 0.136 | 0.049 | 0.148 |
| 70 | | Huda | 22 | 7.30 | 7.18 | 0.367 | 0.049 | 0.080 | 0.044 | 0.156 |

Results of the study indicated the water quality parameters from Creeks/River water bodies in Southwest monsoon. Samples were analysed from 212 villages of 42 Creeks/River of five districts (Tables 1-10).

In the present study, the surface water temperature varied from 27-36 °C. The highest water temperature of 36 °C was observed in Chandigon - Dahanu creek, due to discharge from thermal power plant release of water. The optimum range of water temperature for Aquaculture (25-32°C). The creeks viz, Dhahanu river locations (Dhumkhet, Chandigone, Pale, and Dhakati Dahanu) and Vahghotan River (Trilot & Padel) characteristics exceeded the optimum values. However the present range will not have any adverse impact for the cage culture.

The turbidity was in the range of 5-110 NTU. The high turbidity of 110 and 96 NTU were observed in Dandi and Pamtembi of Banganga River. The optimum ranges of turbidity for Aquaculture (20-60 NTU). The creeks viz, in Dhahanu river locations, (Dahanu, Chandigone & Asangaon), Banganaga River (Pamtembi, Dandi), Murba Creek (Vikaswadi), Murpo satpathi Creek (Dapoli), Makunsar Creek (Mochimar Kelve & Zenda Aali), Rajpuri Creek (Kandane), Vashishti River (Waghivare Bordi) and Pangera Creek (Ansure Danda) water quality parameters have exceeded the optimum values.

The creek water current flow ranged 0–2.40 ft/s; the high flow rate was recorded in Toradi-Savitri River due to tidal amplitude and wind direction. The current flow rate below (1 ft/s) is optimum for Cage Aquaculture. The creeks viz, Dhahanu river locations (Dhumkhet, Chandigone, Pale, Matgaon & Dhakati Dhahanu), Vaitrana River (Vehaloli, Kharmendi, Kasarali and Karvele), Vasai Creek (Kasheli & Kalher), Patalaganga Creek (Khar Simadevi & Rave), Kundalika Creek (Bongang & Nidi), Kalinje creek (Kalinje & Kurawade), Savitri River (Toradi & Pangalol), Vashishti River (Bophan), Vahghotan River (Palekarwadi), Gad River (Govkarwada & Pankhol) and Gad River(Chindar Labdewadi) have exceeded the optimum values.

The salinity ranged from 0 - 35 ppt. The minimum 0 ppt in Kudal-Sarambal River, Dhadi-Muchkundi River, Songaon-Vashishtri River, and Ade-Wadi Creek. The Maximum (35 ppt) was observed in Mithmumbari, Thaarmumbari, and Waranwadi of Devgad River. The pH of water samples varied from 6.7- 8.3. The maximum 8.3 value was recorded in Mayekarwadi - Kasarveli creek. There was an influence of industrial wastewater and seawater dilution in Pamtembi River.

DO concentration varied from 0.60 - 9.57 mg/l. The high concentration 9.57 mg/l was observed in Vikaswadi-Murba creek were attributable to wind velocity, monsoon influence and also due to photosynthetic activity evidenced by Chlorophyll *a* (1.161 mg/m³). The DO in level in all creeks were in optimum range except Vasai creek. The DO level in vasai creek in the villages Kasheli (1.62), Dive Anjur (0.94), Kalher (2.63), Maljipada (0.60) and Ghodbundar (2.87 mg/l) were lower than the optimum level, except Dive Kevani-Vasai creek.

Ammonia concentration ranged between 0.001-1.798 mg/l. All the creeks except Pamtembi-Banganga River have indicated the suitability for aquaculture in relation to ammonia. Hence, the above mentioned high level ammonia observed Pamtembi-Banganga River may not be suggested for aquaculture due to pollution by industry effluents.

Nitrite concentration ranged from 0.001-0.828 mg/l. The optimum range of concentration $\text{NO}_2\text{-N}$ was less than 0.01 ppm for aquaculture. All the creeks except Pamtembi-Banganga River have indicated the suitability for aquaculture in relation to nitrite. Hence it could not be recommended for aquaculture due to very high load of industry effluent. The nitrate concentration varied between 0.006 -1.166 mg/l. desired level of nitrate concentration was less than 0.03 ppm. Like ammonia and nitrite concentration, high concentration of nitrate (1.166 mg/l) was observed in Pamtembi-Banganga River. The increased NO_3 concentration during low and high tide in the sampling site is due to the discharge of excessive amount of industrial wastes and sewage. The recorded phosphate values ranged between 0.013 and 0.393 mg/l. Phosphate 0.393 mg/l was recorded in Dive Anjur-Vasai Creek. The higher concentration of inorganic phosphate might be attributed to the end of the monsoon interruption due to rainfall along with terrestrial runoff and discharge from industrial waste.

Chlorophyll *a* concentration varied from 0.048 - 4.266 mg/m^3 . The Chlorophyll *a* concentration of 4.266, 1.161 & 1.020 mg/m^3 were observed in Pamtembi-Banganga River, Dandi-Banganga River, and Vikaswadi-Murba creek Chlorophyll *a* increase was in particularly Pamtembi River coinciding with relatively low salinity (20ppt) and high nutrients load from industry discharge.

The results indicated that physical characteristics played main role in deciding sites and there was less water depth in creeks during low tide. In some places, water turbidity values were high.