Chapter – IV

Result And Discussion

The present work focuses on Ichthyofaunal study in Bhandardara reservoir with respect to qualitative and quantitative analysis. Bhandardara dam is located on Pravara River, which is a major tributary of Godawari River in Maharashtra. This dam is located at latitude 73° 45’ - 47” (E) and longitude 19° 32’ – 30” (N). The dam has a gross water storage capacity of 11,039 mcft./312.63 mcm. Due to its vast water storage capacity, it has a fresh water with aquatic vegetation.

This reservoir is a source of fishery and also has potential for pisciculture. It can generate employment to several people living around the Bhandardara reservoir, Ahmednagar district. During the study period, the focus on how to increase the productivity of the reservoir helps for the development of rural peoples. We also concentrate on ovulation and hatching of eggs and provide fingerlings to the people which they can grow in their paddy fields ultimately it helps for the development of the society. Perusal of literature reveals that much information is not available about ichthyofauna from Bhandardara reservoir. Therefore, the present study is undertaken. The productivity in the aquatic ecosystem has a pronounced effect on diversity. Especially phytoplankton and zooplankton are very important in the food chain and food web of the system. Therefore, in the present study, population dynamics of phytoplankton and zooplankton is planned. Therefore, physico-chemical parameters of the water from Bhandardara reservoir are analyzed in different seasons.
### 4.1 Physico-chemical parameter

#### Site-I Shendi

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Table 4.1: Average value of physiochemical characteristics from sites I of Bhandardara Reservoir. (Jan 2011-Dec 2011)

Graph 4.2: Graphical representation of physiochemical characteristics from sites I of Bhandardara Reservoir. (Jan 2011-Dec 2011)
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<th>TDS mg/l</th>
<th>ACID mg/l</th>
<th>Alk mg/l</th>
<th>CO2 mg/l</th>
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Table-4.3: Average value of physiochemical characteristics from sites –I of Bhandardara Reservoir. (Jan 2011-Dec 2012)

Graph-4.4: Average value of physiochemical characteristics from sites –I of Bhandardara Reservoir. (Jan 2011-Dec 2012)
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<th>Monsoon</th>
<th>Winter</th>
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<tbody>
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<td>Total Dissolved Solid(TDS) mg/l</td>
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<td>6</td>
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Table-4.5-Average value of physico-chemical characteristics of Bhandardara reservoir year 2011

Graph : 4.6 - Graphical representation of physico-chemical characteristics of four different site of Bhandardara reservoir, Site-I, year 2011
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<th>Winter</th>
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<td>Atmospheric Temperature (AT) °C</td>
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<td>Water Temperature (WT) °C</td>
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<td>Total Dissolved Solid (TDS) mg/l</td>
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<td>192</td>
<td>191</td>
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<td>Acidity (Acid) mg/l</td>
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Table: 4.7 - Average value of physico-chemical characteristics of at Site-I, year 2012

Graph: 4.8 - Graphical representation of physico-chemical characteristics of at Site-I, year 2012.
Table-4.9: Monthly Zooplanktons numbers per ml at Site-I, year2011

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Graph-4.10- Graphical representation of Zooplanktons numbers per ml at Site-I, year2011
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Table-4.11: Monthly Zooplanktons numbers per ml at Site-I, year 2012

Graph-4.12: Graphical representation of Zooplanktons numbers per ml at Site-I, year 2012
Table-4.13: Monthly Phytoplanktons numbers per ml at Site-I, year 2011

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Graph -4.14: Monthly Phytoplanktons numbers per ml at Site-I, year 2011
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Table-4.15: Monthly Phytoplanktons numbers per ml at Site-I, year 2012

Graph-4.16: Monthly Phytoplanktons numbers per ml at Site-I, year 2012
### Site-II - Koltembhe

<table>
<thead>
<tr>
<th>Month</th>
<th>AT°C</th>
<th>WT°C</th>
<th>pH</th>
<th>Ec μs/cm</th>
<th>TDS mg/l</th>
<th>ACID mg/l</th>
<th>Alk mg/l</th>
<th>CO2 mg/l</th>
<th>DO mg/l</th>
<th>TH mg/l</th>
<th>Chlo mg/ml</th>
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</thead>
<tbody>
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<td>24</td>
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<td>181</td>
<td>120</td>
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<td>278</td>
<td>1.8</td>
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<tr>
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<td>8.2</td>
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Table: 4.17 Monthly readings in Site-II (January 2011 to December 2011)

Graph - 4.18: Graphical representation of Monthaly view Site-II. (January 2011 to December 2011)
### Table 4.19 Monthly readings in Site-II (January 2012 to December 2012)

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<th>$\text{WT}^0\text{C}$</th>
<th>pH</th>
<th>Ec</th>
<th>TDS mg/l</th>
<th>ACID mg/l</th>
<th>Alk mg/l</th>
<th>CO2 mg/l</th>
<th>DO mg/l</th>
<th>TH mg/l</th>
<th>Chlo mg/ml</th>
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<tbody>
<tr>
<td>Jan</td>
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<td>23.7</td>
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<td>181</td>
<td>120</td>
<td>11.1</td>
<td>278</td>
<td>1.8</td>
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<tr>
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<td>237</td>
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Graph 4.20: Graphical representation of Monthly view Site-II (January 2012 to December 2012)
Bhandardara reservoir - Physico-chemical analysis

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<th>SN</th>
<th>Parameter</th>
<th>site 1</th>
<th>site 2</th>
<th>site 3</th>
<th>site 4</th>
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<tr>
<td>1</td>
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<td>24.3</td>
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<td>24.3</td>
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<td>Water Temperature(WT) °C</td>
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<td>8.1</td>
<td>8.2</td>
<td>8.2</td>
</tr>
<tr>
<td>4</td>
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<td>380</td>
<td>389</td>
<td>395</td>
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<tr>
<td>5</td>
<td>Total Dissolved Solid(TDS) mg/l</td>
<td>213</td>
<td>213</td>
<td>214</td>
<td>215</td>
</tr>
<tr>
<td>6</td>
<td>Acidity (Acid) mg/l</td>
<td>12.3</td>
<td>12.5</td>
<td>12.4</td>
<td>12.3</td>
</tr>
<tr>
<td>7</td>
<td>Alkalinity(Alka) mg/l</td>
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<td>290</td>
<td>285</td>
<td>280</td>
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<td>8</td>
<td>Carbon Dioxide(Co2) mg/l</td>
<td>2.20</td>
<td>2.20</td>
<td>2.10</td>
<td>2.20</td>
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<tr>
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<td>11.0</td>
<td>11.1</td>
<td>11.2</td>
</tr>
<tr>
<td>10</td>
<td>Total Hardness(TH) mg/l</td>
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<td>87</td>
<td>87</td>
<td>86</td>
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<tr>
<td>11</td>
<td>Chloride(Chlo) mg/l</td>
<td>36</td>
<td>35</td>
<td>35</td>
<td>36</td>
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Table: 4.21 - Average value of physico-chemical characteristics of four Site-II, year 2011

Graph: 4.22 - Graphical representation of physico-chemical characteristics of Site-II,
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<tr>
<th>SN</th>
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<th>Site 3</th>
<th>Site 4</th>
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<td>23.5</td>
</tr>
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<td>8.2</td>
<td>8.3</td>
<td>8.3</td>
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<tr>
<td>7</td>
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<td>285</td>
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<tr>
<td>8</td>
<td>Carbon Dioxide (CO2) mg/l</td>
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<td>2.2</td>
<td>2.3</td>
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<td>11.0</td>
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<td>11.2</td>
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<td>87</td>
<td>85</td>
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Table: 4.23 - Average value of physico-chemical characteristics at Site-II, year 2012.

Graph: 4.24 - Graphical representation of physico-chemical characteristics at Site-II, year 2012.
<table>
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<th>Winter</th>
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<td>Potential Hydrogenii(pH)</td>
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<td>7.9</td>
<td>7.6</td>
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<tr>
<td>4</td>
<td>Electrical Conductivity(EC) s/cm</td>
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<td>258</td>
<td>342</td>
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<td>5</td>
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<td>136</td>
<td>192</td>
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<td>Acidity (Acid) mg/l</td>
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<td>16.2</td>
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<td>204</td>
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<tr>
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<td>Carbon Dioxide(Co2) mg/l</td>
<td>3.5</td>
<td>3.9</td>
<td>3.4</td>
</tr>
<tr>
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<td>12.3</td>
<td>11.8</td>
</tr>
<tr>
<td>10</td>
<td>Total Hardness(TH) mg/l</td>
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<td>68</td>
<td>74</td>
</tr>
<tr>
<td>11</td>
<td>Chloride(Chlo) mg/l</td>
<td>55</td>
<td>20</td>
<td>28</td>
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Table: 4.25 - Average value of physico-chemical characteristics at Site-II, year 2011

Graph: 4.26 - Graphical representation of physico-chemical characteristics at Site-II, year 2011
<table>
<thead>
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<th>Parameter</th>
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<th>Monsoon</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>39.3</td>
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<tr>
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<td>Chloride (Chlo) mg/l</td>
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Table: 4.27 - Average value of physico-chemical characteristics at Site-II, year 2012

Graph: 4.28 - Graphical representation of physico-chemical characteristics at Site-II, year 2012
Table-4.29.: Monthly Zooplanktons numbers per ml at Site-II, year2011

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<th>Mar</th>
<th>Apr</th>
<th>May</th>
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<th>Jul</th>
<th>Aug</th>
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<tr>
<td>D</td>
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<td>44</td>
<td>80</td>
<td>91</td>
<td>90</td>
<td>78</td>
<td>65</td>
<td>75</td>
<td>48</td>
<td>81</td>
<td>61</td>
<td>52</td>
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Graph-4.30: Graphical representation of Zooplanktons numbers per ml at Site-II, year2011.
<table>
<thead>
<tr>
<th>Spot</th>
<th>Year</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2012</td>
<td>65</td>
<td>78</td>
<td>86</td>
<td>87</td>
<td>75</td>
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<td>47</td>
<td>56</td>
<td>58</td>
<td>50</td>
<td>59</td>
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<tr>
<td>B</td>
<td></td>
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<td>75</td>
<td>84</td>
<td>93</td>
<td>80</td>
<td>75</td>
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<td>48</td>
<td>48</td>
<td>55</td>
<td>49</td>
<td>87</td>
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<tr>
<td>C</td>
<td></td>
<td>50</td>
<td>80</td>
<td>85</td>
<td>83</td>
<td>86</td>
<td>87</td>
<td>76</td>
<td>46</td>
<td>78</td>
<td>59</td>
<td>52</td>
<td>80</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>69</td>
<td>85</td>
<td>87</td>
<td>80</td>
<td>78</td>
<td>67</td>
<td>89</td>
<td>56</td>
<td>89</td>
<td>89</td>
<td>54</td>
<td>85</td>
</tr>
</tbody>
</table>

Table-4.31: Monthly Zooplanktons numbers per ml at Site-II, year 2012

Graph-4.32: Graphical representation of Zooplankton numbers per ml at Site-II, year 2012
### Site-III- Samrad

<table>
<thead>
<tr>
<th>Month</th>
<th>AT0C</th>
<th>WT0C</th>
<th>pH</th>
<th>Ecs/cm</th>
<th>TDS mg/l</th>
<th>ACID mg/l</th>
<th>Alk mg/l</th>
<th>CO2 mg/l</th>
<th>DO mg/l</th>
<th>TH mg/l</th>
<th>Chlo mg/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
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<td>23.5</td>
<td>7.8</td>
<td>181</td>
<td>113</td>
<td>11.1</td>
<td>237</td>
<td>1.8</td>
<td>4.1</td>
<td>88</td>
<td>38</td>
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<tr>
<td>Feb</td>
<td>26.9</td>
<td>25.9</td>
<td>8.2</td>
<td>190</td>
<td>125</td>
<td>9.8</td>
<td>261</td>
<td>1.97</td>
<td>4.26</td>
<td>78</td>
<td>42</td>
</tr>
<tr>
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<td>31.5</td>
<td>28.9</td>
<td>8.6</td>
<td>199</td>
<td>133</td>
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<td>274</td>
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<td>4.37</td>
<td>98</td>
<td>55</td>
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<tr>
<td>Apr</td>
<td>43.5</td>
<td>42.6</td>
<td>8.5</td>
<td>205</td>
<td>156</td>
<td>8.6</td>
<td>284</td>
<td>2.15</td>
<td>4.61</td>
<td>66</td>
<td>52</td>
</tr>
<tr>
<td>May</td>
<td>42.1</td>
<td>40.6</td>
<td>8.1</td>
<td>254</td>
<td>145</td>
<td>9.6</td>
<td>276</td>
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<td>3.47</td>
<td>70</td>
<td>35</td>
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<td>8.3</td>
<td>294</td>
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<td>30.1</td>
<td>28.4</td>
<td>7.5</td>
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<td>18.9</td>
<td>218</td>
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<td>4.01</td>
<td>98</td>
<td>35</td>
</tr>
<tr>
<td>Oct</td>
<td>27.6</td>
<td>25.4</td>
<td>7.2</td>
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<td>17.1</td>
<td>215</td>
<td>1.92</td>
<td>4.03</td>
<td>92</td>
<td>27</td>
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<tr>
<td>Nov</td>
<td>25.6</td>
<td>23.6</td>
<td>7.6</td>
<td>192</td>
<td>110</td>
<td>18.2</td>
<td>223</td>
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<td>4</td>
<td>85</td>
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<tr>
<td>Dec</td>
<td>26.9</td>
<td>24.5</td>
<td>7.8</td>
<td>189</td>
<td>105</td>
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<td>234</td>
<td>182</td>
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<td>74</td>
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</table>

Table - 4.33: Average representation of Monthly view on site-III, (January 2011 to December 2011)

Graph : 4.34- Graphical representation of Monthly view site-III, (January 2011 to December 2011)
<table>
<thead>
<tr>
<th>Month</th>
<th>AT°C</th>
<th>WT°C</th>
<th>pH</th>
<th>Ec</th>
<th>TDS mg/l</th>
<th>ACID mg/l</th>
<th>Alk mg/l</th>
<th>CO2 mg/l</th>
<th>DO mg/l</th>
<th>TH mg/l</th>
<th>Chlo mg/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>24.4</td>
<td>22.5</td>
<td>7.1</td>
<td>192</td>
<td>136</td>
<td>12.5</td>
<td>270</td>
<td>1.3</td>
<td>4</td>
<td>88</td>
<td>35</td>
</tr>
<tr>
<td>Feb</td>
<td>27.2</td>
<td>25.2</td>
<td>8.2</td>
<td>190</td>
<td>125</td>
<td>9.8</td>
<td>256</td>
<td>1.97</td>
<td>4.26</td>
<td>78</td>
<td>42</td>
</tr>
<tr>
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<td>24.2</td>
<td>8.6</td>
<td>200</td>
<td>133</td>
<td>8.9</td>
<td>273</td>
<td>1.83</td>
<td>4.37</td>
<td>98</td>
<td>55</td>
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<tr>
<td>Apr</td>
<td>43.6</td>
<td>32.5</td>
<td>8.3</td>
<td>210</td>
<td>156</td>
<td>8.6</td>
<td>284</td>
<td>2.15</td>
<td>4.61</td>
<td>66</td>
<td>52</td>
</tr>
<tr>
<td>May</td>
<td>44.5</td>
<td>32.6</td>
<td>8</td>
<td>251</td>
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<td>9.8</td>
<td>276</td>
<td>2.27</td>
<td>3.3</td>
<td>63</td>
<td>40</td>
</tr>
<tr>
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<td>45.2</td>
<td>32.3</td>
<td>8.4</td>
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<td>169</td>
<td>6.6</td>
<td>240</td>
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<td>3.2</td>
<td>70</td>
<td>35</td>
</tr>
<tr>
<td>Jul</td>
<td>43.7</td>
<td>31.3</td>
<td>8.6</td>
<td>292</td>
<td>140</td>
<td>18.5</td>
<td>214</td>
<td>3.1</td>
<td>3.4</td>
<td>69</td>
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</tr>
<tr>
<td>Aug</td>
<td>32.8</td>
<td>25.6</td>
<td>7.8</td>
<td>256</td>
<td>133</td>
<td>19.7</td>
<td>231</td>
<td>3.22</td>
<td>3.95</td>
<td>95</td>
<td>32</td>
</tr>
<tr>
<td>Sep</td>
<td>33.2</td>
<td>24.6</td>
<td>7.5</td>
<td>238</td>
<td>110</td>
<td>18.5</td>
<td>218</td>
<td>2.11</td>
<td>4.01</td>
<td>98</td>
<td>34</td>
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<tr>
<td>Oct</td>
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<td>23.4</td>
<td>7.6</td>
<td>221</td>
<td>112</td>
<td>17.8</td>
<td>215</td>
<td>1.92</td>
<td>4.03</td>
<td>92</td>
<td>26</td>
</tr>
<tr>
<td>Nov</td>
<td>28.6</td>
<td>22.6</td>
<td>7.4</td>
<td>196</td>
<td>125</td>
<td>18.5</td>
<td>223</td>
<td>1.9</td>
<td>4.1</td>
<td>85</td>
<td>35</td>
</tr>
<tr>
<td>Dec</td>
<td>26.3</td>
<td>20.5</td>
<td>7.1</td>
<td>215</td>
<td>112</td>
<td>15.2</td>
<td>190</td>
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<td>75</td>
<td>34</td>
<td>19</td>
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</table>

Table 4.35: Average representation of Monthly view on site-III, (January 2012 to December 2012)

Graph 4.36: Graphical representation of Monthly view on site-III, (January 2012 to December 2012)
### Physico-chemical analysis

<table>
<thead>
<tr>
<th>SN</th>
<th>Sampling Site</th>
<th>Site 1</th>
<th>Site 2</th>
<th>Site 3</th>
<th>Site 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Atmospheric Temperature (AT) °C</td>
<td>24.38</td>
<td>24.6</td>
<td>24.3</td>
<td>24.33</td>
</tr>
<tr>
<td>2</td>
<td>Water Temperature (WT) °C</td>
<td>23.49</td>
<td>23.3</td>
<td>23.44</td>
<td>23.41</td>
</tr>
<tr>
<td>3</td>
<td>Potential Hydrogenii (pH)</td>
<td>8.2</td>
<td>8.2</td>
<td>8.1</td>
<td>8.1</td>
</tr>
<tr>
<td>4</td>
<td>Electrical Conductivity (EC) s/cm</td>
<td>395</td>
<td>363</td>
<td>385</td>
<td>380</td>
</tr>
<tr>
<td>5</td>
<td>Total Dissolved Solid (TDS) mg/l</td>
<td>215</td>
<td>211</td>
<td>213</td>
<td>213</td>
</tr>
<tr>
<td>6</td>
<td>Acidity (Acid) mg/l</td>
<td>12.3</td>
<td>12.4</td>
<td>12.3</td>
<td>12.5</td>
</tr>
<tr>
<td>7</td>
<td>Alkalinity (Alka) mg/l</td>
<td>280</td>
<td>280</td>
<td>280</td>
<td>290</td>
</tr>
<tr>
<td>8</td>
<td>Carbon Dioxide (CO2) mg/l</td>
<td>2.2</td>
<td>2.3</td>
<td>2.2</td>
<td>2.2</td>
</tr>
<tr>
<td>9</td>
<td>Dissolved Oxygen (DO) mg/l</td>
<td>11.21</td>
<td>11.2</td>
<td>11.1</td>
<td>11.01</td>
</tr>
<tr>
<td>10</td>
<td>Total Hardness (TH) mg/l</td>
<td>86</td>
<td>86</td>
<td>87</td>
<td>87</td>
</tr>
<tr>
<td>11</td>
<td>Chloride (Chlo) mg/l</td>
<td>36</td>
<td>35</td>
<td>36</td>
<td>35</td>
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</tbody>
</table>

Table: 4.37 - Average value of physico-chemical characteristics of site-III, year 2011.

Graph: 4.38 - Graph showing average value of physico-chemical characteristics site-III, year 2011.
### Physico-chemical analysis

<table>
<thead>
<tr>
<th>SN</th>
<th>sampling site</th>
<th>site 1</th>
<th>site 2</th>
<th>site 3</th>
<th>site 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Atmospheric Temperature (AT) °C</td>
<td>25.0</td>
<td>24.5</td>
<td>24.33</td>
<td>24.5</td>
</tr>
<tr>
<td>2</td>
<td>Water Temperature (WT) °C</td>
<td>23.5</td>
<td>23.5</td>
<td>23.41</td>
<td>23.5</td>
</tr>
<tr>
<td>3</td>
<td>Potential Hydrogenii (pH)</td>
<td>8.3</td>
<td>8.2</td>
<td>8.1</td>
<td>8.2</td>
</tr>
<tr>
<td>4</td>
<td>Electrical Conductivity (EC) s/cm</td>
<td>388</td>
<td>365</td>
<td>380</td>
<td>365</td>
</tr>
<tr>
<td>5</td>
<td>Total Dissolved Solid (TDS) mg/l</td>
<td>219</td>
<td>215</td>
<td>213</td>
<td>215</td>
</tr>
<tr>
<td>6</td>
<td>Acidity (Acid) mg/l</td>
<td>12.4</td>
<td>12.5</td>
<td>12.5</td>
<td>12.5</td>
</tr>
<tr>
<td>7</td>
<td>Alkalinity (Alka) mg/l</td>
<td>285</td>
<td>290</td>
<td>290</td>
<td>290</td>
</tr>
<tr>
<td>8</td>
<td>Carbon Dioxide (Co2) mg/l</td>
<td>2.3</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
</tr>
<tr>
<td>9</td>
<td>Dissolved Oxygen (DO) mg/l</td>
<td>11.1</td>
<td>11.0</td>
<td>11.01</td>
<td>11.0</td>
</tr>
<tr>
<td>10</td>
<td>Total Hardness (TH) mg/l</td>
<td>87</td>
<td>86</td>
<td>87</td>
<td>86</td>
</tr>
<tr>
<td>11</td>
<td>Chloride (Chlo) mg/l</td>
<td>33</td>
<td>34</td>
<td>35</td>
<td>34</td>
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Table: **4.39** - Average value of physico-chemical characteristics at site-III, year 2012

Graph: **4.40** Graph showing Average value of physico-chemical characteristics of site-III, year 2012.
<table>
<thead>
<tr>
<th>SN</th>
<th>Parameter</th>
<th>Summer</th>
<th>Monsoon</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Atmospheric Temperature (AT) °C</td>
<td>39.1</td>
<td>31.7</td>
<td>23.8</td>
</tr>
<tr>
<td>2</td>
<td>Water Temperature (WT) °C</td>
<td>32.4</td>
<td>30.2</td>
<td>22.6</td>
</tr>
<tr>
<td>3</td>
<td>Potentia Hydrogenii (pH)</td>
<td>8.5</td>
<td>8.1</td>
<td>7.6</td>
</tr>
<tr>
<td>4</td>
<td>Electrical Conductivity (EC) s/cm</td>
<td>439</td>
<td>258</td>
<td>342</td>
</tr>
<tr>
<td>5</td>
<td>Total Dissolved Solid (TDS) mg/l</td>
<td>233</td>
<td>136</td>
<td>192</td>
</tr>
<tr>
<td>6</td>
<td>Acidity (Acid) mg/l</td>
<td>7.5</td>
<td>19.1</td>
<td>15</td>
</tr>
<tr>
<td>7</td>
<td>Alkalinity (Alka) mg/l</td>
<td>353</td>
<td>204</td>
<td>227</td>
</tr>
<tr>
<td>8</td>
<td>Carbon Dioxide (Co2) mg/l</td>
<td>1.4</td>
<td>3.7</td>
<td>2.7</td>
</tr>
<tr>
<td>9</td>
<td>Dissolved Oxygen (DO) mg/l</td>
<td>4.2</td>
<td>11.2</td>
<td>11.8</td>
</tr>
<tr>
<td>10</td>
<td>Total Hardness (TH) mg/l</td>
<td>94</td>
<td>65</td>
<td>74</td>
</tr>
<tr>
<td>11</td>
<td>Chloride (Chlo) mg/l</td>
<td>52</td>
<td>17</td>
<td>28</td>
</tr>
</tbody>
</table>

Table: 4.41- Average value of Physico-chemical properties in different season at site-III, (2011)

Graph: 4.42- Graph showing seasonal variation in different parameters on site-III, (2011)
<table>
<thead>
<tr>
<th>Parameter</th>
<th>summer</th>
<th>Monsoon</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atmospheric Temperature (AT) °C</td>
<td>38.3</td>
<td>30.7</td>
<td>22.8</td>
</tr>
<tr>
<td>Water Temperature (WT) °C</td>
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<td>20.6</td>
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<tr>
<td>Potential Hydrogenii (pH)</td>
<td>8.5</td>
<td>9.1</td>
<td>7.1</td>
</tr>
<tr>
<td>Electrical Conductivity (EC) s/cm</td>
<td>342</td>
<td>258</td>
<td>258</td>
</tr>
<tr>
<td>Total Dissolved Solid (TDS) mg/l</td>
<td>191</td>
<td>192</td>
<td>192</td>
</tr>
<tr>
<td>Acidity (Acid) mg/l</td>
<td>12</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Alkalinity (Alka) mg/l</td>
<td>254</td>
<td>227</td>
<td>227</td>
</tr>
<tr>
<td>Carbon Dioxide (CO2) mg/l</td>
<td>2.9</td>
<td>2.7</td>
<td>2.7</td>
</tr>
<tr>
<td>Dissolved Oxygen (DO) mg/l</td>
<td>10.8</td>
<td>11.8</td>
<td>11.8</td>
</tr>
<tr>
<td>Total Hardness (TH) mg/l</td>
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<td>74</td>
</tr>
<tr>
<td>Chloride (Chlo) mg/l</td>
<td>38</td>
<td>28</td>
<td>28</td>
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Table- 4.43- Average value of Physico-chemical properties in different season at site-III, (2012)

Graph: 4.44 Graph showing seasonal variation in different parameters site-III, M.S. India. [During January- December 2012]
### Site-IV-Panjare

<table>
<thead>
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<th>Month</th>
<th>AT°C</th>
<th>WT°C</th>
<th>pH</th>
<th>Ec</th>
<th>TDS mg/l</th>
<th>ACID mg/l</th>
<th>Alk mg/l</th>
<th>CO2 mg/l</th>
<th>DO mg/l</th>
<th>TH mg/l</th>
<th>Chlo mg/ml</th>
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</thead>
<tbody>
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<td>24.5</td>
<td>7.1</td>
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<td>78</td>
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<td>133</td>
<td>8.9</td>
<td>274</td>
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Table:4.45- Monthly readings in four sites of at site-IV (Jan 2011 to Dec 2011)

![Graph showing monthly variation in different parameters in at site-IV, [M.S] India.](image)

**Fig:** 4.46-Graphs showing monthly variation in different parameters in at site-IV, [M.S] India.

(During January 2011 - December 2011)
### Table: 4.47 - Monthly readings in four sites of site-IV (Jan 2012 to Dec. 2012)

<table>
<thead>
<tr>
<th>Month</th>
<th>AT°C</th>
<th>WT°C</th>
<th>pH</th>
<th>Ec</th>
<th>TDS mg/l</th>
<th>ACID mg/l</th>
<th>Alk mg/l</th>
<th>CO2 mg/l</th>
<th>DO mg/l</th>
<th>TH mg/l</th>
<th>Chlo mg/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>24.8</td>
<td>23.5</td>
<td>7.1</td>
<td>190</td>
<td>130</td>
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<td>278</td>
<td>1.3</td>
<td>4.1</td>
<td>86</td>
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<tr>
<td>Feb</td>
<td>29</td>
<td>27.2</td>
<td>8.2</td>
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<td>125</td>
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<td>261</td>
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<td>4.3</td>
<td>78</td>
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<tr>
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<tr>
<td>Apr</td>
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<td>31.6</td>
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<tr>
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<tr>
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**Fig:** 4.48 - Graphs showing monthly variation in different parameters in of site-IV. (During January 2012 - December 2012)
Table: 4.49: Monthly Total Zooplankton number per ml at four spot on site-IV,

(Jan2011-Dec 2011)

<table>
<thead>
<tr>
<th>Spot</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
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<tbody>
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<td>82</td>
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<td>50</td>
<td>59</td>
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<tr>
<td>B</td>
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<td>78</td>
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<td>49</td>
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<td>C</td>
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<td>98</td>
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<td>78</td>
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<tr>
<td>D</td>
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<td>93</td>
<td>72</td>
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<td>75</td>
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<td>79</td>
<td>58</td>
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Graph-4.50-Graphical representation of four sites at site-IV (2011)
### Physico-chemical analysis

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<th>Site-2</th>
<th>Site-3</th>
<th>Site-4</th>
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<td>23.1</td>
<td>23.5</td>
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<tr>
<td>3</td>
<td>Potential Hydrogenii(pH)</td>
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<td>8.1</td>
<td>8.2</td>
<td>8.2</td>
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<td>4</td>
<td>Electrical Conductivity(EC)</td>
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<td>380</td>
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<td>Total Dissolved Solid(TDS)</td>
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<td>218</td>
<td>215</td>
</tr>
<tr>
<td>6</td>
<td>Acidity (Acid)</td>
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<td>8</td>
<td>Carbon Dioxide(Co2)</td>
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<td>2.1</td>
<td>2.2</td>
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<td>11.01</td>
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<td>11.3</td>
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<td>87</td>
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<td>85</td>
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<tr>
<td>11</td>
<td>Chloride(Chlo)</td>
<td>34</td>
<td>34</td>
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Table: 4.51: Average value of Physico-chemical properties in different season at site-IV (During January 2012 - December 2012)

**Graph:** 4.52 - Graphical representation of four sites at site-IV (2012)
<table>
<thead>
<tr>
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<th>Winter</th>
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<td>Atmospheric Temperature (AT)</td>
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</tr>
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<td>2</td>
<td>Water Temperature (WT)</td>
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<td>29.1</td>
<td>20.1</td>
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<tr>
<td>3</td>
<td>Potential Hydrogenii (pH)</td>
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<tr>
<td>4</td>
<td>Electrical Conductivity (EC)</td>
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<td>250</td>
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<td>Total Dissolved Solid (TDS)</td>
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<tr>
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<td>7</td>
<td>Alkalinity (Alka)</td>
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<td>204</td>
<td>235</td>
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<tr>
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<td>Carbon Dioxide (CO2)</td>
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<td>3.9</td>
<td>3.4</td>
</tr>
<tr>
<td>9</td>
<td>Dissolved Oxygen (DO)</td>
<td>4.8</td>
<td>12.3</td>
<td>11.1</td>
</tr>
<tr>
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<td>Total Hardness (TH)</td>
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<td>74</td>
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<td>Chloride (Cl)</td>
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Table: 4.53: Monthly Total seasons wise readings of site-IV, MS. India. (Jan. 2011-Dec 2011)

Graph: 4.54: Monthly Total seasons wise readings site-IV, (Jan 2011-Dec 2011)
<table>
<thead>
<tr>
<th>SN</th>
<th>Parameter</th>
<th>summer</th>
<th>Monsoon</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Atmospheric Temperature(AT)</td>
<td>39.3</td>
<td>31.7</td>
<td>23.8</td>
</tr>
<tr>
<td>2</td>
<td>Water Temperature(WT)</td>
<td>37.6</td>
<td>29.2</td>
<td>21.6</td>
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<tr>
<td>3</td>
<td>PotentialHydrogenii(pH)</td>
<td>9.5</td>
<td>8.1</td>
<td>7.7</td>
</tr>
<tr>
<td>4</td>
<td>Electrical Conductivity(EC)</td>
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<td>256</td>
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</tr>
<tr>
<td>6</td>
<td>Acidity (Acid)</td>
<td>12</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>7</td>
<td>Alkalinity(Alka)</td>
<td>245</td>
<td>234</td>
<td>212</td>
</tr>
<tr>
<td>8</td>
<td>Carbon Dioxide(Co2)</td>
<td>2.1</td>
<td>2.7</td>
<td>2.7</td>
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<tr>
<td>9</td>
<td>Dissolved Oxygen(DO)</td>
<td>12.8</td>
<td>11.1</td>
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<tr>
<td>10</td>
<td>Total Hardness(TH)</td>
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<tr>
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<td>Chloride(Chlo)</td>
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</table>

Table:4.55: Monthly Total seasons wise readings site-IV-(Jan2011-Dec 2012)

Graph:4.56: Monthly Total seasons wise readings site-IV,( Jan2011-Dec 2012)
Ichthyofaunal studies were carried out of reservoirs namely Shendi, Koltembhe, Samrad, and Panjaresite during the period January 2011 to December 2011 and January 2012 to December 2012. The report presents the result of monthly variation of physicochemical Parameters, monthly variation of diversity and density of Phytoplankton, zooplankton and diversity of fishes.

The quality of life is linked with the quality of environment, hence biological components, of fresh water depend solely on better physicochemical conditions, and therefore analysis of physicochemical Parameters of water is essential. Eleven physicochemical parameters Such as Atmospheric Temperature (AT), Water Temperature (wt), PotentiaHydrogenii (pH), Electrical conductivity (EC), Total Dissolved Solid (TDS), Acidity (acid), Alkalinity (Alk), Carbon Dioxide (CO$_2$), Dissolved oxygen (DO), Total Hardness (TH) and Chloride (Chlo) of Surface water of these three reservoirs were monitored on monthly basis.

1. Atmospheric temperature of surface water ranges from 24.2$^\circ$C to 43.6$^\circ$C, 24.0$^\circ$C to 43.6$^\circ$C, 24.6$^\circ$C to 43.4$^\circ$C and 24.6$^\circ$C to 43.6$^\circ$C for Shendi, Koltembhe, Samrad, and Panjaresite respectively during the study period.

2. Water temperature of surface water ranges from 22.4$^\circ$C to 33.1$^\circ$C, 23.5$^\circ$C to 32.6$^\circ$C, 23.5$^\circ$C to 33.6$^\circ$C, 23.5$^\circ$C to 32.6$^\circ$C for Shendi, Koltembhe, Samrad, and Panjaresite respectively during the study period.

3. Variation range of pH of reservoir water was narrow i.e. Between 74 to 8.6, 7.1 to 8.6, 7.2 to 8.6 and 7.2 to 8.6 for Shendi, Koltembhe, Samrad, and Panjaresite respectively during the study period. In general pH of water was towards alkaline side.

4. Electrical conductivity is measure of the salt content of water in the form of ions. EC values from 182µs/cm to 291µs/cm, 181µs/cm to 294 µs/cm, 181µs/cm to 294µs/cm and 180µs/cm to 294µs/cm for Shendi, Koltembhe, Samrad, and Panjaresite respectively during the study period.

5. Dissolved solids (TDS) are various kinds of mineral substances present in the water. Some dissolved organic matter may also contribute to total dissolve solids. TDS value ranges from 147mg/l to 269mg/l , 110mg/l to 169mg/l , 105mg/l to 168mg/l and 110mg/l to 169mg/l for Shendi, Koltembhe, Samrad, and Panjaresite respectively during the study period.
6. Acidity value range from 6.5mg/l to 15.2mg/l, 8.6mg/l to 19.4mg/l, 6.5mg/l to 19.5mg/l and 8.6mg/l to 19.6mg/l for Shendi, Koltembhe, Samrad, and Panjaresite respectively during the study period. The threshold value of acidity is about 200 mg/l and the observed values are far less than this, indicating the acidity of sample water is in safe range.

7. In the present study alkalinity ranges from 172 mg/l to 356mg/l, 214mg/l to 284mg/l, 215mg/l to 284mg/l and 198mg/l to 286mg/l for Shendi, Koltembhe, Samrad, and Panjaresite respectively during the study period. Alkalinity above 100 mg/l is indicative to high productive nature of water.

8. The CO$_2$ ranges between 1.3mg/l to 3.7mg/l, 1.8mg/l to 3.22mg/l, 1.8mg/l to 3.22mg/l, and 1.3mg/l to 3.22mg/l for Shendi, Koltembhe, Samrad, and Panjaresite respectively during the study period. The CO$_2$ variation indicates the dynamic nature of reservoir water during study period.

9. The DO value ware ranged between 2.1mg/l to 11.5mg/l, 3.2mg/l to 4.61mg/l, 3.4mg/l to 4.61mg/l and 3.1mg/l to 4.62mg/l for Shendi, Koltembhe, Samrad, and Panjaresite respectively during the study period. Dissolved oxygen is a fundamental requirement for all life. Many countries set as quality standard at a threshold concentration of 5.0

10. The hardness (TH) of water range from 62 mg/l to 98 mg/l, 39 mg/l to 97 mg/l, 39 mg/l to 94 mg/l, 35 mg/l to 79 mg/l for Shendi, Koltembhe, Samrad, and Panjaresite respectively during the study period. Dissolved oxygen is a fundamental requirement for all life.

11. The chloride concentration is very low and chance of toxicity hazard is almost nil. In present study the chloride concentration is very low and 29mg/l to 47mg/l to 17mg/l to 54mg/l, 17mg/l to 52mg/l, 16mg/l to 43mg/l, from Shendi, Koltembhe, Samrad, and Panjaresite respectively during the study period.

12. In the present study, in study area Shendi, Koltembhe, Samrad, and Panjaresite Zooplanktons population observe to have belonging to 17 genera, 6 belongs to cladocera, 4 belong to Copepoda, 6 belongs to Rotifera and 1 belong to Ostracoda. It is observe that Zooplankton population in reservoir shows higher magnitude during summer and winter although lower magnitude during monsoon.

13. The result of fish fauna recorded in present study of study area Shendi, Koltembhe, Samrad, and Panjaresite confirm the occurrence 21 fishes belongs 17 genera, 6 Families
and 3 Orders. The order Cypriniformes was dominant with 12 species followed by order Preciformes with 8 species, while the order like Osteoglassiformes with 1 species were recorded in Shendi, Koltembhe, Samrad, and Panjaresite respectively during the study period.

14. Total fifty nine different types of genera were collected from the study area. Total four sites were selected and tested for different algal taxa. Different numbers of taxa were listed at each site which is presented. In all Chlorophyceae showed dominance at all three sites followed by cyanophyceae, charophyceae and least genus shown by Xanthophyceae. No of algae recorded showed descending order as sites goes away from dam, except Chlorophyceae at Site 2. Group xanthophyceae shown on single genus but it was present at all stations.

15. The reservoir occupy fraction of the landscape. In rural area these small water bodies are important resources for human use. They have intrinsic ecological and environmental values. Beside, human usage, they are used for many commercial purposes including fishing and irrigation.
### 4.5. GENERAL CONCLUSION

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Shendi</th>
<th>Koltembhe</th>
<th>Samrad</th>
<th>Panjare</th>
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<tbody>
<tr>
<td>AT°C</td>
<td>24.3-43.6</td>
<td>24-43.6</td>
<td>24.6-43.5</td>
<td>24.6-43.5</td>
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<tr>
<td>WT°C</td>
<td>23.4-43.1</td>
<td>23.6-42.6</td>
<td>23.5-42.6</td>
<td>23.5-42.6</td>
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<tr>
<td>pH</td>
<td>7.2-8.6</td>
<td>7.1-8.6</td>
<td>7.2-8.6</td>
<td>7.1-8.6</td>
</tr>
<tr>
<td>EC(µs/cm)</td>
<td>182-290</td>
<td>181-294</td>
<td>181-294</td>
<td>180-294</td>
</tr>
<tr>
<td>TDS (mg/l)</td>
<td>147-269</td>
<td>110-169</td>
<td>105-169</td>
<td>110-169</td>
</tr>
<tr>
<td>Acidity(mg/l)</td>
<td>6.5-15.1</td>
<td>8.6-19.5</td>
<td>6.5-19.5</td>
<td>8.6-19.6</td>
</tr>
<tr>
<td>Alkalinity(mg/l)</td>
<td>171-356</td>
<td>214-284</td>
<td>215-284</td>
<td>198-285</td>
</tr>
<tr>
<td>Co₂(mg/l)</td>
<td>1.3-3.6</td>
<td>1.8-3.22</td>
<td>1.8-3.22</td>
<td>1.3-3.22</td>
</tr>
<tr>
<td>DO(mg/l)</td>
<td>2.1-11.5</td>
<td>3.2-4.61</td>
<td>3.4-4.61</td>
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<tr>
<td>TH(mg/l)</td>
<td>62-98</td>
<td>39-97</td>
<td>39-94</td>
<td>34-79</td>
</tr>
<tr>
<td>Chloride (mg/l)</td>
<td>29-47</td>
<td>17-54</td>
<td>17-52</td>
<td>16-43</td>
</tr>
</tbody>
</table>

Table: 4.5.1: Physico-chemical characteristics of four reservoir (2012)
4.2 Aquatic insect diversity

The analysis was based on 4 sampling sites because 4 sites showed an absence of aquatic insect species. Among the Odonata, the habit of laying eggs in phytotelmatais, with one exception, limited to tropical or sub-tropical species (Corbet 1983), with over half of the 39 species known to develop in these microhabitats occurring in the neotropics. The moderate temperatures and high rainfall of the tropics maketreeholes there a predictable and fairly persistent source of freshwater in moist forests where ponds and lakes are less common than they are in temperate regions, and where streams are often seasonal.

Plecoptera:

Many stoneflies are represented by just one genus of the smallest groups in terms of species richness, the nymphal stages of almost all species but three remain undescribed.

Odonata:

In country’s dragon- and damselfly fauna is very well known, especially the adults, but also, to some extent, the immatures.

Lepidoptera:

In these areas, larvae of the genus *Petrophila* (Crambidae) can very frequently be encountered in dams and can be locally very abundant. They scrape algae from the surface of stones and rocks, while other aquatic Lepidoptera larvae feed on vascular plants in standing water, some of them living in portable cases like caddisflies. Very little has been studies have focused on taxonomic descriptions of adults.

Coleoptera:

The descriptions of aquatic beetle species from several families, collected from study area. A taxonomic review for aquatic and semiaquatic beetle families.

Diptera:

The Diptera, more than 14 families have aquatic young stages, which can be found in a wide variety of aquatic and semi-aquatic habitats. In Costa Rica, groups of medical interest early received special attention, for example the families.
4.3 Plankton density

The two-year average phytoplankton density of the Lake and that at different stations suggested that the nutrient impact on the system in general was quite low, characteristic to oligotrophic systems. In general, algal density fluctuations across different stations were significant during the pre-monsoon and northeast monsoon but insignificant during the southwest monsoon. Throughout the seasons Chlorophyta dominated at all stations. Another significant tendency noticed was the dominance of Desmids over Chlorococcales among Chlorophyta throughout the seasons at most of the stations which suggested a normal trophic structure expected of a typical unpolluted freshwater system. In the lakes Zooplanktons also important in aquatic food chain. It is found that Cladocera group, Copepoda and Rotefera are common. The Lake is famous for its endemic fish fauna. The system therefore offers a typical system for depth study of Desmids and their interrelationships with endemic fish fauna. Correlation studies of hydrobiology with physico-chemical parameters revealed that the relationship between phytoplankton density in general and that of the specific groups are highly complex and often controlled by interactions of different factors, some of which are unidentified. However, certain groups were found to be positively correlated with certain parameter, while certain other groups were found negatively correlated with certain parameters. In developing definite and clear trends of interaction between different factors and hydrobiology of water body two-year monitoring is minimal. In developing such trends a long term monitoring is essential.

A) Phytoplankton

The phytoplankton sampling on monthly basis was carried out January 2011 to December 2011, January 2012 to December 2012 respectively two months from each season i.e. Summer – February and April, Rainy – June and August, Winter – December and January). The phytoplankton samples were collected monthly after filtering 5 liter of surface water at sampling site I from each reservoir using phytoplankton net (Mesh size 35µm, photograph of net, and later fixing them in 5 percent formaldehyde solution. The samples were stored in good quality of glass bottles.
For qualitative and quantitative study, the samples were poured into graduated centrifuge tube of 10 ml capacity. It was observed that the lake have a collection of so many algal genera of different class. It was reported that genus *Anabaena, Nostoc, Spirulina, Phormidium, Merismopedia* that belongs to the class *Cyanophyta* with 5 number of species. Genus *Oedogonium, Mougeotia, Chlorella, Cosmarium, Hydrodictyon*, *Pediastrum, Pithophora, Volvox, Eudorina, Spirogyra, Scenedesmus, Coleochaete, Staurastrum, Planktospaeria, Quadrigula, Crucigenia*, that belongs to the class *Chlorophyta* of species. Genus *Navicula, Pinularia, Amphiplura, Stauroneis, Epithemia, Hantzschia, Gyrosigma, Tabellaria*, *fenestrata, Melosira, Synedra, Anphora*, that belong to class *Bacillariophyta* of species. Genus *Chlorobotrys* that belong to class *Xanthophyta* with single number of species. The pond also shows the presence of Algal blooms and various algal forms. These algal forms belong to the class *Chlorophyta*.

Total fifty nine different types of genera were collected from the study area. Total four sites were selected and tested for different algal taxa. Different numbers of taxa were listed at each site which is presented in table. In all Chlorophyceace showed dominance at all four sites followed by cyanophycea, charophycea and least genus shown by Xanthophyceae. The taxonomic enumeration is given in table. Total 35 different types of genus were recorded at study site S₁, where as 46 and 27 at site S₂, S₃, and S₄ respectively. No of algae recorded showed descending order as sites goes away from dam, except Chlorophyceae at Site 2. Group xanthophyceae shown on single genus but it was present at all stations.

**B) Zooplankton**

Zooplankton are vital to the health of a lake ecosystem because they feed upon the phytoplankton and are food themselves for many fish species. Protection of the lake’s zooplankton community through proper water quality management practices protects the lake’s fishery. Zooplanktons are also important to lake water quality. The zooplankton community is generally comprised of three groups: Cladocera, Copepoda, and Rotifera. If present in abundance, large Cladocera can decrease the number of algae and improve water transparency within a lake.
Zooplankton samples were collected from June through September at the south whole station. Total zooplankton increased from June to August, reaching a peak density of late-August. Although there was a significant changes in the phytoplankton community. The total numbers of zooplankton and the seasonal pattern are very similar between the two years. In August, 2011, rotifers comprised approximately 80 percent of the zooplankton, whereas in 2012, they comprised only 20-40 percent of the zooplankton in August. The improved transparency in 2012 may have increased the fish predation of larger zooplankters, resulting in a higher percentage of rotifers, a smaller zooplankter.

However these parameters are extremely variable from place to place and from time to time. These parameters also interact with each other in a variety of ways. In such conditions it is rather difficult to draw specific conclusions about the individual effects of these parameters on population densities of zooplanktons. But it can be expressed in general that the fluctuating patterns of physico-chemical conditions of water affects the distribution of zooplankton.

This microscopic taxonomical study of zooplankton revealed that 17 genera belonging to four major groups of Zooplankton (Rotifera, Cladocera, Copepoda and Ostracoda) inhabited the body of water. These groups with their respective genera composition are.

4.4 Fish

Fishes were caught for the present study from Bhandardara dam by local fisherman, by operating cast net and during Government operation using drag nets and gill net with the help of boat for its collection. A period of one year from January 2011 to December 2012. Fishes were identified using the standard keys of Day, F. (1989), Mishra, K.S. (1959), Jhingran (1991) Jayaram (1999) and Shrivastava (1998).

During the entire study period different fish varieties have been observed in Bhandardara dam, Dist-Ahmednagar (MS) India. It shows rich biodiversity. In the present investigation various species observed. Total 21 species were identified initially in Bhandardara Dam. Family Cyprinidae is most dominant species in Bhandardara Dam.

1. **Puntiusticto** (Ham-Buch)

*Cyprinusticto* Hamilton, (Plate I).

Type-locality: Southern east part of Bengal
**Common name:** Fire Fin barb.

**Local name:** Kudale.

**Diagnostic characters:** Deep bodied fish having two blotches, one above pectoral (on 3-5 scales) and the other above anal (16-21) Barbels absent. Dorsal fin osseous, its posterior margin serrated. Lateral line is incomplete.

**Distribution:** India.

**Elsewhere:** Pakistan, Sri Lanka, Bangladesh, Myanmar, Thailand.

**Status:** Common.

**Remark:** These are boat shaped fishes normally attain size up to 5-6 cms. Males have dorsal, pectoral and anal fins reddish, where few have tubercles on the snout. It is widely distributed species in India. It is silvery, popular aquarium fish.

2. *Catlacatla*(Ham-Buch)

*Cyprinuscatla* Hamilton, *Fish Ganges*,

**Common name:** Catla.

**Local name:** Catla.

**Diagnostic characters:** Body short, deep. Abdomen rounded, head broad, large. Snout bluntly rounded, may be with pores. Mouth wide, anterior, arched. Eyes are large in anterior half of head. Upper lip is absent. Lower jaw is movable articulation at the symphysis but without a prominent knob. Barbells are absent. Dorsal fin long inserted above pectoral fin, with 17-19 rays (3 or 4 simple), and without any spines. Anal fin short with 8 rays (5 branched). Lateral line complete with 40-43 scales.

**Distribution:** India: Northern India; Wardha river basin Pradhan, (1997).

**Elsewhere:** Pakistan: Indus plain and adjoining hills; Bangladesh, Nepal, Myanmar. It also introduced into rivers of Peninsular India and Sri Lanka.

**Status:** Common.

**Remark:** It is renowned and faster growing Indian major carp. Originally it was confined to North of Krishna. It supports important fishery. It is Non-predatory fish, surface and mid-water feeder. It grows to a length of 25-26 cm. Under optimum condition it grows up to 70 cm. in the first year. At the end of 3 years it grows up to 120 cms.*Catla* attains sexual maturity at the age of 2 years. It is commercially important hardy fish. It is good fish for tank angling. It fights well.
Hypophysation (Artificial propagation) is successful. From this hybrids and golden
coloured *Catla* stock can be formed.

3. **Labeorohita (Ham-Buch)**

*Cyprinus rohita*, Hamilton, (Plate I). (Type-locality: Gangetic provinces).

**Common name:** Rohu.

**Local name:** Rohu/Tambadamassa.

**Diagnostic characters:** Moderately elongate body, dorsal profile more arched. Snout depressed,
projecting, devoid of lateral lobes. Eyes are large; lips are thick and fringed, with distinct inner
fold, one pair of barbell present. Lateral line scale 40-44. Colour: bluish on the back. Silvery
colour on flanks and beneath with reddish mark on each scale.

**Distribution:** North and Central India.

**Elsewhere:** Terai region of Nepal, Myanmar, Bangladesh and Pakistan.

**Status:** Common.

**Remark:** It is major carp of India, which also is transplanted to abroad. It survives in fresh water
below Alt. 550 m. Various Fishery Departments cultivate major carps: Rohu, Mrigal and Catla.
Rohu is bottom feeder, feeding on plants and decaying vegetation. It attains sexual maturity at
the end of 2\textsuperscript{nd} year, spawns in flooded rivers. Spawns can be collected and cultivated in tanks.
The fecundity varies from 22 lakhs to 2.5 crores. It is next to but fetches more prices for its tasty
flesh. It attains a length of 1 meter. Riverine fish is stronger. It is also a game fish.

4. **Puntius sophore (Ham-Buch)**

*Cyprinus sophore*, Hamilton,

**Common name:** Stingma barb.

**Local name:** Tepali.

**Diagnostic characters:** Deep bodied fish without colour bands. Body depth is 2 to 3.5 times in
SL. Barbells absent. Dorsal spines ossified smooth. Lateral line complete with 23-25 scales. Two
black spots present on the scales 4-6 and 22-24.

**Distribution:** Widely distributed in India.

**Elsewhere:** Pakistan, Nepal, Sri Lanka, Bangladesh.

**Status:** Moderate.
Remark: It closely resembles to *P. chola*. The specimen examined was having a district black blotch at the base of dorsal fin. It moves in shoal and is a good aquarium fish. It is of medicinal value and common in Tamil Nadu and West Bengal. It is 8-9 cm in size.

5. *Oreochromismossambica* (Peters)

* Tilapia mossambica* Peters,

**Common name:** Mozambique cichlid.

**Local name:** Tilapia.

**Diagnostic characters:** Body more or less elongate. Abdomen rounded. Head compressed, with concave upper profile. Cleft of mouth short, lower jaw slightly longer. Dorsal fin is origin above pectoral fin base, spinous part longer than soft part which may be prolonged with a filamentous tip. Lateral line is incomplete or interrupted. Caudal fin is subbed truncate.

**Distribution:** A native freshwater fish from Southern Africa that has been introduced throughout India.

**Elsewhere:** Pakistan, Sri Lanka, Bangladesh, Myanmar, Thailand.

**Status:** Common.

**Remark:** Due to their aggressive nature and omnivorous diet, they dominate other native species and thus dominate the water bodies whenever they occur. It is 9-10 cm in size.

6. *Channapunctatus* (Bloch)

* Ophiocephalus punctatus* Bloch,

**Common name:** Spotted snakehead.

**Local name:** Dakalya.

**Diagnostic characters:** Elongated body, rounded in cross section. Plain pectorals extend to anal fin. Pelvic fin is about 75% of pectoral fin. Scales in L.L. 37-40. Colour: Black-green dorsally, and on flanks. Ventral side is pale yellow-reddish. Many dark blotches present on flanks or numerous black spots present on body and also on dorsal and caudal fin. Five scales between pre-orbital angle and posterior border of summit.


**Elsewhere:** Afghanistan, Pakistan, Nepal, Sri Lanka, Bangladesh, Myanmar.

**Status:** Rare.
**Remark:** It is a medium to large sized fish prefers stagnant water, muddy bottom dweller and can withstand slightly polluted water. Prolific breeder, breeds in ponds throughout year by forming nest. Peak breeding is before and during monsoon. The fish mature in 1st year. It was collected from 600 m. Altitude from North Bengal. It is 13-14 cm in size.

Suborder PERCOIDEI
Family AMBASSIDAE

7. *Chandanama* (Ham-Buch)

*Chandanama*, Hamilton,

**Common name:** Elongate glass perchlet.

**Local name:** Fancy.

**Diagnostic characters:** Body ovate, strongly compressed. Mouth is large with prominent lower jaw. Lateral line with 100-107 scales. Snout is sharp and transparent. Eyes are large, superior. Two dorsal fins, the 1st with seven spines and 2nd with 9-18 rays. A forwardly directed procumbent spine present in the dorsal fin. L.L. discontinuous, a dark blotch on dorsal fin upper edge is present.

**Distribution:** Throughout India, Wardha river Pradhan, (1997).

**Elsewhere:** Pakistan, Bangladesh, Nepal and Myanmar.

**Status:** Very rare.

**Remark:** It inhabits fresh, brackish water lotic and lentic. A low priced fish. It can be used for malaria and guinea worm control. It is 5-6 cm in length.

8. *Parambassisranga* (Ham-Buch)

*Chandaranga*, Hamilton,

**Common name:** Indian glassy fish.

**Local name:** Chembardi.

**Diagnostic characters:** Body snout, deep and compressed. Pre-opercula hind edge smooth. Mouth oblique, scales small, L.L. with 47-63 scales. A lateral line is district. A dark spot present.

**Distribution:** Throughout India; Wardha river Pradhan, (1997).

**Elsewhere:** Pakistan, Bangladesh, Myanmar, Malaysia, Thailand.

**Status:** Moderate.

**Remark:** Colour: Greenish yellow, silvery. A silvery broad lateral stripe is present on sides of body. It is good aquarium fish. It makes nest and guards its young. It is 3-7 cm in size.
Family CLARIIDAE

9. *Clarias batrachus* (Linn)

*Silurus batrachus* Linnaeus,

**Common name:** Magur.

**Local name:** Mangur.

**Diagnostic characters:** Body elongated, head depressed. Mouth terminal, four pairs of barbels present. Maxillary extend up to Pectoral, Pectoral spines strong, serrated. Dorsal and anal fin are very long.


**Elsewhere:** Pakistan, Nepal, Bangladesh, Myanmar, Indonesia, Singapore, Borneo and Philippines.

**Status:** Common.

**Remark:** It inhabits foul, stagnant, muddy water. It is hardy fish, favorite food fish, can be used as animal in laboratory. The air bladder yield is in glass. It breeds early in July-August undertakes short migrations; withstand oxygen debt condition, as it possesses accessory respiratory organ. Induced breeding experiments are successful. It can be cultured.

**Order- Osteoglossiformes**


Family- NOTOPTERIDAE

Moderately large fishes elongate with the body board, strongly compressed laterally, with fine scales on head also. Abdomen serrated before thee pelvic fin. Eyes large superior, Maxilla extend to below middle of orbit, cleft of mouth lateral, Maxilla well toothed and firmly bound together with premaxilla, Dorsal fin single. Anal fin very long caudal fin bifurcate, Pelvic fin rudimentary or absent, Lateral line present.

Genes- *Notopterus lacepede*

Carniodorsal profile usually almost straight, sometime slightly concave. Jaw not increasing in length throughout the life, extending only to posterior border of eyes. Proerucular scale row six to eight
10. **Species- Notopterus notopterus** (Pallus) (plate-4.6.1)

**Order-CYPRINIFORMES**

Body along, with small to large scale. Head without scale Mouth usually protractile and always toothless. Maxillaries reduced. Lower pharyngeal have reduced number of teeth. A single dorsal fin. No adipose dorsal fin, barbal often present. Pelvic fin abdominal. Lateral line present

**Family -CYPRINIDAE**

Body with scale, generally compressed, abdomen rounded. Eyes never covered with skin. Mouth transverse, superior, inferior or terminal with or without sucker, more or less protractile and toothless. Lower jaw may be prominent, sharp or rounded. Gill opening wide, Barbels one or two pair, present or absent, No adipose dorsal fin, Lateral line complete or incomplete

**Genus - Salmophasiaswasinson**

Body elongated, compressed. Abdomen keeled from below pectoral fin to anus, keel not hardened. Head moderate to long, compressed. Snout blunt may be short or long and pointed. Mouth oblique to body axis, cleft reaching anterior margin of orbint or slightly ahead. Eyes moderate or large, lateral or superiolateral. Lips thin. Lower jaw longer, Dorsal fin short, inserted mostly apposite anal fin, Pectoral complete general decurved.

11. **Species – Salmophasiabacaila** (Hamilton-Buchanan)(plate-4.6.2)


12. **Species– Salmophasiaacinaces** (*valenciennes*) (plate-4.6.3)

Laterial line scale less than 70(42to45). Anal fin with 16 to 19 branched ray. Lateral line slightly curved

**Genus-Chela Hamilton-Buchanan**

Body long, compressed. Abdomen keeled from below pelvic region to anus. Head short, compressed. Snout blunt. Mouth oblique, cleft reaching to below front margin of eye large, lateral, in middle of head. Lips thin. Dorsal fin with 9 to 13 rays. Pectrol fin stout and elongate. Anal fin with 13 to 26 rays. Caudal lobes equal. Lateral line curved downward wit 34 to 68 scale

13. **Species -Chela labuca** (Hamilton-Buchanan) (plate-4.6.4)
Genus - *Rasbora* Bleeker


14. Species - *Rasbora daniconius* (Hamilton-Buchanan) (plate-4.6.5)

Genus - *Cyprinus* Linnaeus

Body robust anteriorly, more or less compressed. Abdomen rounded. Head Moderate. Snout obtusely rounded. Mouth terminal, oblique, cleft not extending to anterior margin of eyes. Eyes moderate, superolateral in anterior part of head not visible from below ventral surface, Lips fleshy, Upper jaw more or less projecting, Barbell two pair, one pair each of rostral and maxillary. Dorsal fin very long, inserted above tip of pectrol fins with three spines and 17 rays. Anal fins short with three spines and five rays. Caudal fin deeply forked, lobes pointed. Scale large, pentagonal, cycloid. Lateral line straight with 36 scales.

15. Species - *Cyprinus scorpeo* Linnaeus (4.6.6)

Genus - *Puntius* Hamilton-Buchanan

Body short to moderately elongate, deep, compressed. Abdomen rounded. Head short. Snout obtuse, conical or pointed. Mouth arched, anterior or inferior. Eyes moderate to large, dorsolateral, not visible from below ventral surface, Lips thin, Barbell four, two or none. Dorsal fin short, inserted nearly apposite pelvic fin with 9 to 13 rays. Anal fin short with seven to nine rays. Caudal fin forked. Scale small, moderate or large. Lateral line complete or incomplete with 20 to 47 scales.

16. Species - *Puntius amphibian* (valenciennes) (plate-4.6.8)

Barbel two. Lateral line scale 23-24. Lateral line incomplete

Genus - *Cirrhinus* Okunen

Body, moderate elongate, compressed. Abdomen rounded. Head short. Snout obtusely rounded. Mouth wide transverse, Eyes moderately large, in anterior half of head, not visible from below ventral surface. Upper lip fringed not continuous with lower. Barbell four, two small or none. Dorsal fin inserted ahead of pelvic fin with 10 to 19 rays and without any spine, Anal fin short with seven or eight rays. Caudal fin forked. Lateral line completes with 35 to 45 scales.
17.Species-Cirrhinus mrigala (Hamilton-Buchanan) (plate-4.6.9)

Barbell two, small. Dorsal fin with 15 to 16 rays. Lateral line scale 40 to 45.

Genus-Labeocuvier

Body small or moderated, elongated to deep with abdomen rounded. Head fairly large. Snout more or less swollen, rounded, often projecting beyond mouth. Mouth moderate or narrow, curved, semilunar, somewhat inferior, fairy anterior. Jaws with sharp margin. Lip thick. Fleshy, fringed, covering both jaws. Eyes moderately large, not visible from below ventral surface. Barbel always present, one or two pair. Pharyngeal teeth hooked. Dorsal fin inserted above anterior to origin of pelvic fin with 11 to 26 rays without spine. Anal fin short with 7 to 8 rays. Caudal fin deeply forked. Scale large, moderate or small. Lateral line complete, straight or little curved.

18.Species–Labeobata (Hamilton-Buchanan) (plate-4.6.11)

One pair of barbels. Lateral line scale 40 or less than 40. Pectoral fin as long as head. Snout over hanging mouth without any lateral lobe. Dorsal fin inserted nearer snout than caudal fin. Snout conical and projecting, lip thin. Lower fringed.

Order- Perciformes

Skin with scales, commonly ctenoid. Mouth may be protractile, Head and cheeks with muciferous canal, pore. Bones of head commonly with numerous pungent spines. Teeth may be present or absent on vomer, palatine. Two dorsal fins first spine. An adipose fin pelvic fin with spines, usually with five rays. Anal fins with spines. Caudal fins rays never more than 17.

Family- Ambassidae (Glass fish)

Body short, elevated, oblong, compressed, slightly translucent. Moderate to small, cycloid scales on head and body. Opercle without spine ending in a membranous flap. Teeth on jaws and palate. Two dorsal fins with spinous and soft part. Anal fins with spines. Lateral line complete or interrupted.

Genus- Chanda Hamilton–Buchanan

Body ovate, deep, compressed, more or less diaphanous. Abdomen rounded, head short compressed. Snout sharp, mouth wide, protactile, extending ot front border of orbit. Posterior nostril vertically oval. Eyes large, superior may be visible from below ventral surface. Lips thin, lower jaw strongly projecting. Jaws palate with villiform teeth. Two dorsal fins, the first with about 7 spines and 15 to 17 rays, two fins continuous. A forwardly directed recumbent spines present in dorsal fins. Anal fins with three spines and 17 rays. Caudal fins forked, scale cycloid,
very small, cheek, gill cover, predorsum above lateral line and body just below base of dorsl fin without scales. Dorsal and ventral profiles equal with depression in orbital region. Lower jaw very prominent. Lateral line complete.

19. **Species- Glossogobius giuris**

**Family- Channidaemurrel**

Body elongate, cylindrical anteriorly. Body with large scale, head with plate like scale. Cephalic pit present. Teeth on jaws, vomer and palate. A single long spineless dorsal fin present and a similar anal fin, both free from caudal fin. Lateral line abruptly curved or almost interrupted.

**Genus- Channascopoli**

Body elongated, sub cylindrical anteriorly. Abdomen rounded. Head large, depressed with plate like scale. Snout somewhat obtuse. Mouth fairly large, opening moderate to wide, may extended to below orbit. Eyes lateral, moderate, in anterior part of head, not visible from below ventral surface. Lips moderate. Jaws sub equal, lower jaw protruding beyond upper. Teeth on jaws and palate. Gill opening wide, membrane of two sides connected beneath isthmus. Dorsal fin long, inserted almost above pectoral fins with 29 to 55 rays. Anal fin long, with 21 to 36. Both dorsal and anal fins free from caudal. Caudal fin rounded. Scale small, cycloid or ctenoid; scale on head larger than those on body with concentric ring toward their margin. Lateral line abruptly curved or almost interrupted.

20. **Species- Channastriata** (plate-4.6.15)

Dorsal fin rays 37-46. In life adult grey to black-green on upper side from middle of side upward very pale yellow to silvery, belly usually pure white. Caudal fin dark, with two distinct pale vertical band on its base.

21. **Garramullya** (Sykes)

*Chondrostomamullya*, Sykes. **Common name:** Mullyagarra.

**Local name:** Mallya.

**Diagnostic characters:** Body short, compressed, abdomen rounded, head depressed and snout blunt. Mouth is inferior, transverse and semicircular. Eyes are small, in the posterior half of head, lateral, not visible from below. Lips are thick, fleshy. A suctorial disc of semicartilagenous pad present on the chin, formed below ventral lip. Dorsal fin inserted slightly ahead of the pelvic.
Paired fins horizontal, none plaited. Anal fin short with 6-8 rays. Lateral line complete with 34 scales.

**Material examined:** 1 ex., Chaskaman Dam, S. V. Theurkar and Date - 04/09/2010.

**Distribution:** Throughout India except Assam and Himalaya.

**Status:** Very common.

**Remark:** These fishes commonly occur in tank, rivers and in hill streams. Paired fins are adapted to without in swift moving current. It is a bottom dweller. One or two rows of are lateral, elliptical, brownish-black blotches present on body. It is 12-13 cm in size.
<table>
<thead>
<tr>
<th>S.N</th>
<th>Order</th>
<th>Family</th>
<th>Species</th>
<th>Common name</th>
<th>Local name</th>
<th>Eco. value</th>
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Table: 4.4.1 Fish diversity of Bhandardara dam during year 2012
Fish biodiversity

We detected a strong relationship between the number of native species and basin surface area which accounted for 82% of the variation in native species richness. Basin area was also an important factor explaining variations in endemnicity, rarity and taxonomic singularity values. The analysis of these indexes showed that smaller basins usually feature widely distributed species belonging to the most diversified genera.

<table>
<thead>
<tr>
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<tr>
<td></td>
<td>3</td>
<td>Simocephalus species</td>
</tr>
<tr>
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<td>4</td>
<td>Ceriodaphnia species</td>
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<tr>
<td></td>
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<tr>
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</tbody>
</table>

Table: 4.4.2: Zooplankton diversity of Bhandarda reseroin

*Simocephalus* are large, 3-4 mm in length, round animals that are covered in a bivalve carapace. The head, which contains a single compound eye, is not covered by this carapace but
instead is surrounded by a hood. Attached to the head are a very small rostrum and the first antennules, which contain olfactory setae. The mouthparts of Simocephalus sp. are small and they lack maxillipeds. Simocephalus sp. uses its second antennae as swimming appendages while the five thoracic legs are used for filtering food or respiration. The dorsal side of the thorax is called the brood pouch, an extension of the carapace, and is where the eggs are held.

*Ceriodaphnia* is a species of water flea in the class Branchiopoda, living in freshwater lakes, ponds, and marshes in most of the world. They are small, generally less than 1 millimetre (0.039 in) in length. Males are smaller than females. *Ceriodaphniadubia* move by using a powerful set of second antennae.

*Diaptomus* is a genus of copepods with a single eye spot. It is superficially similar in size and appearance to *Cyclops*. However it has characteristically very long first antennae that exceed the body length. In addition, the females carry the eggs in a singlesac rather than the twin sacs seen in *Cyclops*. It is a copepod of larger freshwater lakes and still waters.

*Brachionus* is a genus of planktonic rotifers. Rotifers such as *Brachionuscalyciflorus* are favored test animals in aquatic toxicology because of their sensitivity to most toxicants. *Brachionusplacatilis* has been demonstrated to be a large cryptic species complex and it is likely that the number of species present in this genus greatly exceeds those currently described.

*Keratella*, like all rotifers are pseudocoelomates. This is a paedomorphic condition in which the blastocoel remains even once the animal has reached maturity. It is thought that this condition is secondarily derived.

*Daphnia* are small, planktonic crustaceans, between 0.2 and 5 mm in length. *Daphnia* are members of the order Cladocera, and are one of the several small aquatic crustaceans commonly called water fleas because of their saltatory swimming style (although fleas are insects and thus only very distantly related). They live in various aquatic environments ranging from acidic swamps to freshwater lakes, ponds, streams and rivers.

As the dam like Bhandardara is a virgin place and away from human activities restoration and conservation of situation is required. It is not only expensive and requires advanced soft technology, but is also not parallel to the present growth oriented economic policies of the nation. However, the ecological and environmental restoration of the catchment as well as
command sides of the big dams can prove to be a big step forward towards realistic sustainability, keeping the focus on the local socio-economics. The views are parallel with the views of Chakravarty and Tandon (1988). Modifying the on-going and future projects to incorporate the perspective given in this project dissertation may have a far greater significance on larger scale, when the countries of the world are taking serious efforts to combat the global threat of climate change by changing the natural resource use policies and designing agenda for sustainable development that pays justice to Environmental, Economic and Social, the three pillars of sustainability.