CHAPTER - 3

PHYSICAL FEATURES AND WATER
CHEMISTRY OF THE LAKES
Water Temperature :

The water temperature data is presented in Fig.3. and Table 3.

Table 3: Water temperature (°C) data for Waskur lake.

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th></th>
<th>1982</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>XI</td>
<td>XII</td>
</tr>
<tr>
<td></td>
<td>20.5</td>
<td>8.5</td>
<td>8.0</td>
</tr>
</tbody>
</table>

The average water temperature values for the three lakes were almost the same. The usual seasonal trend with maximum values in summer and minimum in winter was recorded. As seen from Fig.3 water temperature showed a gradual rise from May onwards. The peak values were observed in July.
Fig. 3: Surface water temperature fluctuations

- - - - - - - - - - - - - - - - - Waskur lake

- - - - - - - - - - - - - - - - - Dal lake

- - - - - - - - - - - - - - - - - Anchar lake
and August and thereafter, it gradually decreased and the minimum values were recorded in December and January.

Minimum (7°C) and maximum (34°C) water temperature for Waskur lake was recorded in January and July, 1982 with a mean value of 17.3°C (S.D. ± 8.4). In Anchar lake the highest temperature (26°C) was recorded in August and the lowest (7.5°C) in January, 1983 (7 : 17.2 ; S.D. ± 5.8). Dal lake depicted maximum water temperature of 28°C and 29°C for D₁ and D₂ sites in July, 1982 while minimum temperature (7°C) at the both the sites was recorded in December, 1982 and January, 1983. The mean water temperature for Dal lake being 17.2°C.

Hydrogen -ion concentration

The pH data is illustrated in Fig. 4 and in Table 4 (Waskur).

Table 4: Variation in pH value of Waskur lake.

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th></th>
<th>1982</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>XI</td>
<td>XII</td>
<td>I</td>
<td>II</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td>8.7</td>
<td>8.5</td>
<td>8.1</td>
<td>8.5</td>
<td>8.3</td>
<td>8.3</td>
</tr>
</tbody>
</table>

The average hydrogen-ion concentration value for Waskur lake was slightly higher than the other two lakes.
Fig. 4: Time variations in pH

- - - - - D₂  Dal lake

- - - - - Waskur lake

- - - - - Anchar lake
The seasonal trend was almost identical with high pH recorded in spring and low in autumn. Waskur lake recorded a minimum pH value of 8.1 in December, 1981 and maximum of 8.8 in May, 1983 ($\bar{x} : 8.4 ; S.D. \pm 0.21$). The two sites of Dal lake did not show any significant variations in pH which ranged from a minimum of 7.2 in September, 1982 to a maximum of 9.3 in May, 1982 at D2 site ($\bar{x} : 8.3 ; S.D. \pm 0.63$). The pH range of 8.0 (April) to 9.2 (May) ($\bar{x} : 8.6 ; S.D. \pm 0.51$) was recorded at D1 site. In Anchar lake H-ion concentration increased from 7.2 in October and December, 1982 to 9.0 in May, 1983 ($\bar{x} : 7.93 ; S.D. \pm 0.55$).

The pH values at site D1 (Dal lake) were generally higher and those of Anchar lake were lower in comparison to other sites (Fig. 4). In Waskur lake pH declined from May to July, 1982 and then fluctuated till November and stabilized at 8.2 till January, 1983. In Anchar lake pH decreased from 8.5 in May to 7.4 in June, 1982. The values increased to 8.3 in the next month. But towards autumn the declining trend was once again discernible. However, from January, 1983 onwards pH showed steady upward trend registering peak value of 9.0 in May, 1983. At site D1 pH fell from 8.7 in May to 8.1 in June and then peaked to 9.3 in August, 1982. The values fluctuated till December and then remained at 8.8 till next spring. However, in April
pH value of only 8.0 was recorded which was followed by a sudden rise to 9.2 in May, 1983. The values at site D2 showed more or less similar trend.

Specific Conductivity:

Temporal variations in the conductivity values of the lake waters are presented in Fig. 5 and Table 5.

In Waskur lake conductivity values peaked in November, 1981; July, 1982 and February, 1983 and low value was recorded in May, 1983. Peak values for Dal lake were recorded in February (D2) and March, 1983 (D1) and the minimum specific conductance was observed in May, 1982 (D2) and September, 1982 (D4). Anchar lake waters depicted high conductivity values for major part of the present investigation with maximum conductivity recorded in February, 1983.

Table 5: Specific conductance values (μS/cm\(^{-1}\) at 25°C) for Waskur lake.

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th>1982</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>XI</td>
</tr>
<tr>
<td></td>
<td>280</td>
<td>350</td>
</tr>
</tbody>
</table>
Fig. 5: Temporal variations in conductivity.

\[ \text{Dal lake} \]
\[ \text{Waskur lake} \]
\[ \text{Anchar lake} \]
From Table 5 it is evident that the conductivity values varied significantly during winter-spring period.

The specific conductance data for the three lakes is represented as under:

<table>
<thead>
<tr>
<th>Lake</th>
<th>Range</th>
<th>$\bar{x}$</th>
<th>± S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waskur</td>
<td>224-350</td>
<td>294</td>
<td>39</td>
</tr>
<tr>
<td>Dal $D_1$</td>
<td>95-211</td>
<td>135</td>
<td>34</td>
</tr>
<tr>
<td>Dal $D_2$</td>
<td>91-190</td>
<td>131</td>
<td>28</td>
</tr>
<tr>
<td>Anchar</td>
<td>122-526</td>
<td>316</td>
<td>138</td>
</tr>
</tbody>
</table>

It has been observed that the mean conductance values for Anchar and Waskur lakes were much higher in comparison to Dal lake.

From Fig.5 it is apparent that the conductivity values for both the sites of Dal lake were lower than the other two lakes. These sites depicted almost same values with slight seasonal variations. In Anchar lake the values showed an upward trend from May to July and thereafter remained constant till October. The values once again fluctuated with a small peak obtained in October and a major one (525 μmhos) attained in February. In Waskur lake the values showed irregular trend.
The overall seasonal fluctuations in conductivity values were quite characteristic with peaks recorded in spring (D₁), summer (Waskur) and winter (D₂ and Anchar) and low values observed in spring (Waskur and Anchar), summer (D₂) and autumn (D₁).

Dissolved Oxygen:

Data on dissolved oxygen concentration is shown in Fig. 6 and Table 6.

The average DO values for the surface waters of Waskur lake were higher by 2.73 mg l⁻¹ and 1.40 mg l⁻¹ over Anchar and Dal lake values. Low values for dissolved oxygen (7.8 mg l⁻¹) for Waskur were recorded in October, 1981 and high concentrations (19.2 mg l⁻¹) were observed in January, 1983 (X: 12.55; S.D. ± 2.94). The two sites of Dal lake depicted marked variations in their DO content. At site D₁ the values varied from 8.4-17.9 mg l⁻¹ (X: 13.24; S.D. ± 3.14) with minimum recorded in June and August, 1982 and maximum in January, 1983. Oxygen content ranged from 4.9 mg l⁻¹ (September, and November, 1982) to 19.0 mg l⁻¹ (January, 1983) at site D₂ with an average value of 9.07 mg l⁻¹ (S.D. ± 4.42). In Anchar lake the oxygen concentration varied from 3.2 to 19.6 mg l⁻¹ (X: 9.82; S.D. ± 3.94) with minimum value observed in October, 1982 and maximum in February, 1983.
Fig. 6: Time variations in dissolved oxygen

Waskur
Anchar lake

Dal lake

D_1
D_2
Table 6: Variations in the dissolved oxygen content (mg l\(^{-1}\)) of Waskur lake.

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th>1982</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>XI</td>
</tr>
<tr>
<td></td>
<td>7.8</td>
<td>9.6</td>
</tr>
</tbody>
</table>

From Table 6 it is observed that DO content of Waskur lake remained high during December and January and for other months not much change was observed. Maximum DO values at all the investigated sites were recorded in January - February (Fig.6).

The seasonal peaks and depressions in DO concentration are summarised as:

<table>
<thead>
<tr>
<th>Lake</th>
<th>Max.(mg l(^{-1}))</th>
<th>Min.(mg l(^{-1}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waskur</td>
<td>14.36 (Winter)</td>
<td>10.91 (Spring)</td>
</tr>
<tr>
<td>Dal D1</td>
<td>16.53 (Winter)</td>
<td>8.50 (Summer)</td>
</tr>
<tr>
<td>D2</td>
<td>13.33 (Winter)</td>
<td>5.13 (Autumn)</td>
</tr>
<tr>
<td>Anchar</td>
<td>14.52 (Winter)</td>
<td>5.66 (Autumn)</td>
</tr>
</tbody>
</table>
Oxygen saturation:

The oxygen saturation values (Table 7a, b) ranged from 122.21 (November, 1981) to 294.25% (June, 1982) in Waskur ($\bar{x} = 188.87; \text{ S.D.} \pm 51.76$); from 39.58 (October, 1982) to 229.7% (February, 1983) in Anchar ($\bar{x} = 123.74; \text{ S.D.} \pm 46.19$); from 119.57 (June, 1982) to 220.01% (May, 1982) at D1 site ($\bar{x} = 162.75; \text{ S.D.} \pm 28.92$) and from 56.12 (November, 1982) to 240.74% (May, 1982) at D2 site of Dal lake ($\bar{x} = 117.03; \text{ S.D.} \pm 51.54$).

The mean oxygen saturation values were higher in Waskur lake in comparison to other lakes. On seasonal basis the maximum average oxygen saturation values were recorded in Spring (Dal), summer (Waskur) and Winter (Anchar).

Table 7(a): Monthly variations in Oxygen saturation (%) in Waskur lake.

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th>1982</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>XI</td>
<td>XII</td>
</tr>
<tr>
<td>1981</td>
<td>129.13</td>
<td>122.21</td>
</tr>
<tr>
<td>1982</td>
<td>127.13</td>
<td>129.22</td>
</tr>
</tbody>
</table>
Table 7 (b): Oxygen saturation (%) values for the three lakes.

<table>
<thead>
<tr>
<th>Month/Year</th>
<th>Anchar</th>
<th>Waskur</th>
<th>Dal D1</th>
<th>Dal D2</th>
</tr>
</thead>
<tbody>
<tr>
<td>May, 1982</td>
<td>155.85</td>
<td>193.77</td>
<td>220.01</td>
<td>240.74</td>
</tr>
<tr>
<td>June</td>
<td>170.82</td>
<td>294.25</td>
<td>119.57</td>
<td>103.82</td>
</tr>
<tr>
<td>July</td>
<td>138.32</td>
<td>234.00</td>
<td>135.37</td>
<td>95.06</td>
</tr>
<tr>
<td>August</td>
<td>76.80</td>
<td>251.72</td>
<td>131.44</td>
<td>78.89</td>
</tr>
<tr>
<td>September</td>
<td>108.55</td>
<td>256.61</td>
<td>146.68</td>
<td>69.10</td>
</tr>
<tr>
<td>October</td>
<td>39.58</td>
<td>215.48</td>
<td>183.50</td>
<td>119.66</td>
</tr>
<tr>
<td>November</td>
<td>66.44</td>
<td>187.27</td>
<td>162.51</td>
<td>56.12</td>
</tr>
<tr>
<td>December</td>
<td>123.98</td>
<td>127.31</td>
<td>145.82</td>
<td>108.18</td>
</tr>
<tr>
<td>January, 1983</td>
<td>130.34</td>
<td>247.41</td>
<td>180.02</td>
<td>191.08</td>
</tr>
<tr>
<td>February</td>
<td>229.70</td>
<td>248.06</td>
<td>179.49</td>
<td>108.18</td>
</tr>
<tr>
<td>March</td>
<td>111.45</td>
<td>182.32</td>
<td>153.87</td>
<td>58.90</td>
</tr>
<tr>
<td>April</td>
<td>130.83</td>
<td>144.91</td>
<td>148.29</td>
<td>131.24</td>
</tr>
<tr>
<td>May</td>
<td>125.96</td>
<td>208.98</td>
<td>209.25</td>
<td>160.51</td>
</tr>
<tr>
<td>( \bar{x} )</td>
<td>123.74</td>
<td>188.87</td>
<td>162.75</td>
<td>117.03</td>
</tr>
</tbody>
</table>
Total alkalinity:

The alkalinity values were high in Waskur and Anchar lakes and low in Dal lake. From Table 8 and Fig. 7 it has been observed that values ranged from 123 (May, 1983) to 227 \( \text{CaCO}_3 \) mg l\(^{-1}\) (October, 1982) in Waskur lake \((\bar{x} : 164.45 \pm 29.6)\), from 58 (May, 1983) to 275 mg l\(^{-1}\) (October, 1982) in Anchar \((\bar{x} : 149 \pm 59.6)\); from 52 (December, 1982) to 100 mg l\(^{-1}\) (November, 1982 and April, 1983) at \( D_1 \) site \((\bar{x} : 75.69 \pm 15.5)\) and from 47 (April, 1983) to 91 mg l\(^{-1}\) (October, 1982) at site \( D_2 \) of Dal lake \((\bar{x} : 68.23 \pm 15.6)\). The two sites of Dal lake had an average alkalinity value of 71.96 \( \text{CaCO}_3 \) mg l\(^{-1}\). The values generally depicted increasing trend till October/November, 1982 followed by gradual decline and then increased again in March/April, 1983.

Table 8: Total alkalinity (mg l\(^{-1}\)) values for Waskur lake.

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th>1982</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>XI</td>
</tr>
<tr>
<td>1981</td>
<td>158</td>
<td>160</td>
</tr>
<tr>
<td>1982</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>II</td>
</tr>
<tr>
<td>1</td>
<td>207</td>
<td>168</td>
</tr>
</tbody>
</table>
Fig. 7: Fluctuations in alkalinity values

- - - - - - - - - - - - - - - - - - - - - Waskur lake

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - Anchar lake

D₁
D₂

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - Dal lake
The maximum average values were recorded in autumn while the minimum concentrations were observed in spring (Anchar), summer (Waskur) and Winter (Dal). Anchar lake showed distinct seasonal variations in alkalinity values. The peak was observed in autumn followed by decrease in winter. The other two lakes did not exhibit any seasonal variations.

Free Carbon dioxide:

The monthly variations in CO₂ content of the surface waters are shown in Table 9(a,b).

Table 9(a): Carbon dioxide content (mg l⁻¹) for Waskur lake.

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th></th>
<th>1982</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>XI</td>
<td>XII</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>0.63</td>
<td>0.96</td>
<td>2.43</td>
<td>1.24</td>
</tr>
</tbody>
</table>

In Waskur lake the values ranged from 0.36 to 2.43 mg l⁻¹ (\(\bar{x} : 1.39\); S.D. ± 0.63). High levels of CO₂ were recorded in December, 1981 and low in May, 1983. At D₁ site (Dal) the range was between 0.15 to 3.1 mg l⁻¹ (\(\bar{x} : 1.07\); S.D. ± 1.0). Maximum value was recorded in November, 1982 and minimum in December, 1982. Carbon dioxide range of 0.06 (May, 1983) to 10.73 mg l⁻¹ (September, 1982) (\(\bar{x} : 2.21\);
Table 9(b): Carbon dioxide concentration (mg l⁻¹) of surface waters.

<table>
<thead>
<tr>
<th>Month/Year</th>
<th>Dal</th>
<th></th>
<th>Waskur</th>
<th>Anchar</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D₁</td>
<td>D₂</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May, 1982</td>
<td>0.28</td>
<td>N.D.</td>
<td>0.55</td>
<td>0.45</td>
</tr>
<tr>
<td>June</td>
<td>1.30</td>
<td>2.30</td>
<td>1.42</td>
<td>6.77</td>
</tr>
<tr>
<td>July</td>
<td>N.D.</td>
<td>0.10</td>
<td>2.25</td>
<td>1.52</td>
</tr>
<tr>
<td>August</td>
<td>N.D.</td>
<td>1.56</td>
<td>0.70</td>
<td>8.84</td>
</tr>
<tr>
<td>September</td>
<td>1.2</td>
<td>10.73</td>
<td>2.29</td>
<td>10.85</td>
</tr>
<tr>
<td>October</td>
<td>N.D.</td>
<td>3.54</td>
<td>1.81</td>
<td>26.67</td>
</tr>
<tr>
<td>November</td>
<td>3.1</td>
<td>2.66</td>
<td>2.24</td>
<td>14.51</td>
</tr>
<tr>
<td>December</td>
<td>0.15</td>
<td>0.82</td>
<td>1.60</td>
<td>13.09</td>
</tr>
<tr>
<td>January, 1983</td>
<td>0.18</td>
<td>0.90</td>
<td>1.68</td>
<td>3.48</td>
</tr>
<tr>
<td>February</td>
<td>0.19</td>
<td>1.65</td>
<td>0.79</td>
<td>1.99</td>
</tr>
<tr>
<td>March</td>
<td>1.36</td>
<td>2.16</td>
<td>1.18</td>
<td>1.74</td>
</tr>
<tr>
<td>April</td>
<td>1.9</td>
<td>0.09</td>
<td>0.85</td>
<td>0.81</td>
</tr>
<tr>
<td>May</td>
<td>N.D.</td>
<td>0.06</td>
<td>0.36</td>
<td>0.05</td>
</tr>
</tbody>
</table>

N.D. = Not detected.
S.D ± 2.9) was observed at site D2. Anchar lake had higher mean value for CO₂ (\( \bar{x} : 6.98 \); S.D. ± 7.76) in comparison to other lakes. The values varied from 0.05 (May, 1983) to 26.67 mg l⁻¹ (Oct. 1982) with upper values registered from August to December, 1982.

The sites showed identical seasonal pattern with maximum average value in autumn and minimum in spring except at D₁ site where minimum value was observed in winter.

Chloride:

From the data presented in Fig. 8 and Table 10 it has been observed that the chloride content ranged from 13 (March, 1983) to 34 mg l⁻¹ (October, 1981) in Waskur (\( \bar{x} : 19.75 \); S.D. ± 4.9), from 10 (August, 1982) to 36 mg l⁻¹ (May, 1983) at site D₁ (\( \bar{x} : 19.22 \); S.D. ± 7.3), from 9 (October, 1982) to 28 mg l⁻¹ (March, 1983) at site D₂ (\( \bar{x} : 18.76 \); S.D. ± 5.93) and from 11 (May, 1982) to 38 mg l⁻¹ (November, 1982 and February, 1983) in Anchar lake (\( \bar{x} : 24.07 \); S.D. ± 9.4).

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th></th>
<th>1982</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>XI</td>
<td>XII</td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>IV</td>
</tr>
<tr>
<td>34</td>
<td>19</td>
<td>22</td>
<td>15</td>
<td>25</td>
<td>19</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>
Fig. 8: Monthly variations in Chloride content of surface waters.

- - - - - - - - Waskur lake

- - - - - - - - Anchar lake

- - - - - - - - D1 Dal lake

- - - - - - - - D2 Dal lake
The average chloride content in Anchar lake was higher than the Dal and Waskur lakes. The two sites of Dal lake had almost similar values. The maximum average seasonal chloride concentrations of 22.6 (autumn), 22.0 (spring), 22.0 (winter) and 33.6 mg l$^{-1}$ (winter) were recorded for Waskur, sites D$_1$, D$_2$ and Anchar lakes respectively, while their minimum average values of 17.1, 18.6, 14.3 and 16.7 mg l$^{-1}$ were observed in winter, summer, autumn and spring.

Sulphate:

Data on sulphate content of lake waters is shown in Fig.9 and Table 11.

From Fig.9 it is observed that the sulphate concentration values for Anchar and Waskur lakes were generally higher in comparison to Dal lake.

Table 11: Variations in sulphate content (mg l$^{-1}$) for Waskur lake.

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th>1982</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>XI</td>
</tr>
<tr>
<td>1.60</td>
<td>0.94</td>
<td>0.34</td>
</tr>
</tbody>
</table>

In Anchar lake the values fluctuated between 0.35 mg l$^{-1}$ (July, 1982) and 2.62 mg l$^{-1}$ (June, 1982) (x̄: 0.92 ;
Fig. 9: Variations in sulphate content

- - - - - - - Waskur lake
bullet - - - - Anchar lake
bullet - - - - D1 Dal lake
bullet - - - - D2 Dal lake
SULPHATE mg/l
S.D. ± 0.58). In Waskur lake the sulphate concentration had a range of 0.34 mg $l^{-1}$ in December, 1981 and 1.88 mg $l^{-1}$ in July, 1982 ($\bar{x}: 0.77 ; S.D. ± 0.41$). In Dal lake ($D_1$) the range for sulphate was from 0.09 to 0.68 mg $l^{-1}$ ($\bar{x}: 0.29 ; S.D. ± 0.15$) with maximum concentration registered in July, 1982 and the minimum in April, 1983. At $D_2$ site the values ranged from 0.01 (July, 1982) to 0.88 mg $l^{-1}$ (November, 1982) ($\bar{x}: 0.28 ; S.D. ± 0.21$).

The mean sulphate content in Anchar lake was higher by 0.15 mg $l^{-1}$ and 0.64 mg $l^{-1}$ over the value recorded for Waskur and Dal lakes. However, in all the lakes the values remained generally low. Maximum average sulphate content was observed in summer (Waskur and Anchar) and autumn (Dal) and minimum in spring except at $D_2$ site where it was recorded in summer.

Calcium:

The values for calcium in Waskur lake ranged from 24 to 66.8 mg $l^{-1}$ ($\bar{x}: 33.24 ; S.D. ± 11.9$). The maximum concentration was recorded in January, 1982 and minimum in September, 1982. The data is given in Table 12 and represented by Fig.10.
Fig. 10: Variations in Calcium concentration.

- - - - - - - - - - - - Waskur lake
- - - - - - - - - - - - Anchar lake
- - - - - - - - - - - - Dal lake

0° 0°
Table 12: Calcium content (mg l$^{-1}$) in Waskur lake

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th></th>
<th>1982</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>XI</td>
<td>XII</td>
<td>I</td>
<td>II</td>
<td>III</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>-------</td>
<td>------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td>28.4</td>
<td>26.8</td>
<td>62.8</td>
<td>66.8</td>
<td>52.8</td>
<td>54.0</td>
</tr>
</tbody>
</table>

At site D₁ (Dal) the calcium concentration ranged from 10.4 to 50 mg l$^{-1}$ ($\bar{x} = 20$; S.D. ± 10.06) with low values observed in September, 1982 and high in April, 1983. At site D₂ the range was from 12.8 to 26 mg l$^{-1}$ ($\bar{x} = 18.9$; S.D. ± 4.83) with minimum values registered during May and September, 1982 and the maximum during March, 1983. In Anchar lake the values had a range of 23.2 to 58 mg l$^{-1}$ ($\bar{x} = 38.18$; S.D. ± 11.4), with upper concentration recorded in October, 1982 and the lower during May, 1982. Waskur and Anchar lakes had almost similar average calcium content which was higher than the Dal lake.

From Fig. 10 it is evident that the calcium content in Dal lake (sites D₁ and D₂) maintained almost same concentration up to February, 1983; the values increased during subsequent months and decreased towards the end of the investigation period. In Waskur the values gradually increased till March, 1983 and then decreased. But in Anchar the values peaked in October, 1982 and after that no definite
trend was followed.

Seasonal behaviour at two sites of Dal lake was same with spring maximum and autumn minimum. However, in Waskur and Anchar lakes low calcium content was observed in autumn and spring and peak values during winter.

Magnesium:

Temporal variations in the magnesium content of the lake waters is given in Fig.11 and Table 13.

The two sites of Dal lake had almost same magnesium content with values at site D1 ranging from 1.2 mg l⁻¹ (August,1982) to 10.9 mg l⁻¹ (February,1983) (\(\bar{x} = 4.26\); S.D. = 2.77), and at D2 from 0.2 to 8 mg l⁻¹ (\(\bar{x} = 4.12\); S.D. = 2.28). Low values were recorded in June, 1982 and high in October, 1982. In Anchar lake Mg²⁺ concentration recorded a range of 1.9 to 21.8 mg l⁻¹ (\(\bar{x} = 8.88\); S.D. = 6.23) with low values registered in July, 1982 and high in November, 1982. In Waskur lake the values varied from 1.2 (April,1982) to 27.4 mg l⁻¹ (May,1983) (\(\bar{x} = 14.03\); S.D. = 7.93).
Fig. 11: Variations in Magnesium content.

- Warkur lake
- Anchar lake
- Dal lake
Table 13: Magnesium content (mg l\(^{-1}\)) in Waskur lake.

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th>1982</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>XI</td>
<td>XII</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>II</td>
</tr>
<tr>
<td>23.8</td>
<td>26.9</td>
<td>8.0</td>
</tr>
</tbody>
</table>

The lake waters did not exhibit uniform behaviour with respect to magnesium concentration. Waskur lake had higher average mean value in comparison to other lakes. Anchar and Waskur lakes recorded maximum average seasonal values in autumn and minimum during winter and summer. However, no seasonal pattern was discernible in Dal lake.

Sodium:

Monthly fluctuations in the sodium content (mg l\(^{-1}\)) of the lake waters is presented in Table 14 (a, b).

In Waskur lake the average sodium concentration was higher than Dal and Anchar lakes. The values of sodium content varied from 1.1 (May, 1983) to 11 mg l\(^{-1}\) (October, 1981) in Waskur lake (\(\bar{x}: 5.55 \pm 3.28\)). D\(_1\) site (Dal) had a range of 1.6 mg l\(^{-1}\) (October - November, 1982) to 12.0 mg l\(^{-1}\) (June, 1982) with a mean value of 3.66 mg l\(^{-1}\) (S.D. ± 3.02) while at site D\(_2\) the value fluctuated between 1.3 mg l\(^{-1}\)
(October, 1982) and 7.5 mg l\(^{-1}\) (June, 1982) (\(\bar{x} = 3.13\); S.D. \(\pm 2.15\)). In Anchar lake low value (1.3 mg l\(^{-1}\)) was observed in September, 1982 and high (14.4 mg l\(^{-1}\)) in May, 1982 (\(\bar{x} = 5.37\); S.D. \(\pm 3.28\)).

Table 14(a): Sodium content (mg l\(^{-1}\)) in Waskur lake.

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th></th>
<th>1982</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>XI</td>
<td>XII</td>
<td>I</td>
</tr>
<tr>
<td>1981</td>
<td>11.0</td>
<td>8.6</td>
<td>8.4</td>
<td>9.0</td>
</tr>
</tbody>
</table>

The maximum average seasonal value for sodium was recorded in spring (Anchar) and summer (Dal and Waskur) and the minimum in autumn.

Potassium:

Data on potassium concentration is given in Table 15(a,b).

Table 15(a): Variations in Potassium content (mg l\(^{-1}\)) in Waskur lake.

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th></th>
<th>1982</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>XI</td>
<td>XII</td>
<td>I</td>
</tr>
<tr>
<td>1981</td>
<td>4.8</td>
<td>6.2</td>
<td>5.9</td>
<td>6.7</td>
</tr>
</tbody>
</table>
Table 14 (b): Temporal variations in Sodium content (mg l\(^{-1}\)).

<table>
<thead>
<tr>
<th>Month / Year</th>
<th>Anchar</th>
<th>Waskur</th>
<th>Dal (D_1)</th>
<th>Dal (D_2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>May, 1982</td>
<td>14.4</td>
<td>8.4</td>
<td>7.1</td>
<td>5.6</td>
</tr>
<tr>
<td>June</td>
<td>7.6</td>
<td>7.9</td>
<td>12.0</td>
<td>7.5</td>
</tr>
<tr>
<td>July</td>
<td>6.9</td>
<td>7.6</td>
<td>7.1</td>
<td>7.2</td>
</tr>
<tr>
<td>August</td>
<td>1.9</td>
<td>3.8</td>
<td>3.5</td>
<td>4.3</td>
</tr>
<tr>
<td>September</td>
<td>1.3</td>
<td>1.9</td>
<td>1.7</td>
<td>1.5</td>
</tr>
<tr>
<td>October</td>
<td>5.0</td>
<td>1.9</td>
<td>1.6</td>
<td>1.3</td>
</tr>
<tr>
<td>November</td>
<td>5.0</td>
<td>1.9</td>
<td>1.6</td>
<td>1.4</td>
</tr>
<tr>
<td>December</td>
<td>7.7</td>
<td>2.2</td>
<td>1.9</td>
<td>1.9</td>
</tr>
<tr>
<td>January, 1983</td>
<td>5.0</td>
<td>2.8</td>
<td>2.0</td>
<td>1.8</td>
</tr>
<tr>
<td>February</td>
<td>5.1</td>
<td>2.6</td>
<td>2.2</td>
<td>2.0</td>
</tr>
<tr>
<td>March</td>
<td>5.0</td>
<td>2.5</td>
<td>2.1</td>
<td>1.9</td>
</tr>
<tr>
<td>April</td>
<td>2.0</td>
<td>2.0</td>
<td>2.6</td>
<td>2.2</td>
</tr>
<tr>
<td>May</td>
<td>3.0</td>
<td>1.1</td>
<td>2.3</td>
<td>2.1</td>
</tr>
</tbody>
</table>
Table 15 (b) : Potassium content (mg l\(^{-1}\)) of the lakes.

<table>
<thead>
<tr>
<th>Month/Year</th>
<th>Anchar</th>
<th>Waskur</th>
<th>Dal (D_1)</th>
<th>Dal (D_2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>May, 1982</td>
<td>8.2</td>
<td>5.7</td>
<td>3.8</td>
<td>3.2</td>
</tr>
<tr>
<td>June</td>
<td>3.1</td>
<td>6.1</td>
<td>3.9</td>
<td>6.0</td>
</tr>
<tr>
<td>July</td>
<td>1.9</td>
<td>4.8</td>
<td>3.5</td>
<td>5.4</td>
</tr>
<tr>
<td>August</td>
<td>4.4</td>
<td>4.5</td>
<td>3.2</td>
<td>4.2</td>
</tr>
<tr>
<td>September</td>
<td>2.8</td>
<td>1.5</td>
<td>1.0</td>
<td>4.6</td>
</tr>
<tr>
<td>October</td>
<td>8.2</td>
<td>1.9</td>
<td>1.6</td>
<td>1.5</td>
</tr>
<tr>
<td>November</td>
<td>10.6</td>
<td>1.8</td>
<td>1.2</td>
<td>1.0</td>
</tr>
<tr>
<td>December</td>
<td>5.3</td>
<td>0.7</td>
<td>0.7</td>
<td>1.0</td>
</tr>
<tr>
<td>January, 1983</td>
<td>2.0</td>
<td>0.9</td>
<td>0.6</td>
<td>0.8</td>
</tr>
<tr>
<td>February</td>
<td>2.2</td>
<td>0.8</td>
<td>0.9</td>
<td>0.5</td>
</tr>
<tr>
<td>March</td>
<td>1.8</td>
<td>0.8</td>
<td>0.5</td>
<td>0.6</td>
</tr>
<tr>
<td>April</td>
<td>1.0</td>
<td>0.7</td>
<td>0.8</td>
<td>0.5</td>
</tr>
<tr>
<td>May</td>
<td>1.2</td>
<td>0.8</td>
<td>0.9</td>
<td>1.0</td>
</tr>
</tbody>
</table>
The potassium content of Waskur lake varied from 0.7 (December, 1982 and April, 1983) to 6.1 mg l\(^{-1}\) (June, 1982) \(\bar{x} = 2.38 \pm 1.99\); at site D1, the range was between 0.6 (January, 1983) to 3.9 mg l\(^{-1}\) (June, 1982) with a mean value of 1.73 mg l\(^{-1}\) (S.D. ± 1.27), at site D2 between 0.5 (February and April, 1983) to 6.0 mg l\(^{-1}\) (June, 1982) \(\bar{x} = 2.33 \pm 1.96\) and in Anchar lake from 1.0 (April, 1983) to 10.6 mg l\(^{-1}\) (November, 1982) \(\bar{x} = 4.05 \pm 2.99\). The average potassium content was higher in Anchar in comparison to Dal and Waskur lakes.

The upper seasonal values were observed in summer (Dal and Waskur) and autumn (Anchar) and the minimum concentration was recorded in spring (Anchar and Waskur), autumn (Waskur) and winter (Dal).

Silicate:

From the data presented in Fig.12 and given in Table 16 it has been observed that Waskur had higher silicate values than the other two lakes. The average value in this lake being higher by 1.70 mg l\(^{-1}\) and 1.72 mg l\(^{-1}\) over Dal and Anchar lakes. The silicate concentration did not show distinct seasonal behaviour. The upper values were recorded in autumn (Waskur) and summer (Dal and Anchar).
Fig. 12: Monthly fluctuations in silicate concentration.

- Anchar lake
- Waskur lake
- Dal lake

D_1
D_2
The silicate concentration in Waskur ranged from 0.6-11.5 mg l\(^{-1}\) (\(\bar{x}: 3.71\); S.D. \(\pm\) 2.77) with minimum recorded in March, 1982 and the maximum in February, 1983.

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th>1982</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>XI</td>
</tr>
<tr>
<td></td>
<td>4.8</td>
<td>7.8</td>
</tr>
</tbody>
</table>

In Anchar lake the minimum value of 0.4 mg l\(^{-1}\) was registered in June, 1982 and the maximum of 6.3 mg l\(^{-1}\) observed in August, 1982. The mean value was 1.99 mg l\(^{-1}\) (S.D. \(\pm\) 1.59). The silicate content of the site D1 (Dal lake) ranged from 0.2 (November, 1982) to 5.6 mg l\(^{-1}\) (August, 1982) (\(\bar{x}: 2.01\); S.D. \(\pm\) 1.58) and at D2 site the range was from 0.2 (April, 1983) to 5.4 mg l\(^{-1}\) (February, 1983) with a mean value of 2.02 mg l\(^{-1}\) (S.D. \(\pm\) 2.18).

The silicate concentration increased in August, 1982 in all cases and then fluctuated through autumn. The values once again peaked in February in Dal and Waskur lakes. The concentration was below the detection level in October and
March ($D_2$), December (Dal and Waskur) and January (at all the sites).

Iron:

In Dal lake iron concentration ranged from 40-270 $\mu$g $l^{-1}$ ($\bar{x} = 144$ $\mu$g $l^{-1}$). The peak values were registered in September, 1982 for both the sites and the minimum values were recorded in November, 1982 and May, 1983 (Fig. 13). In Anchar lake the concentration fluctuated from 60 ($\mu$g $l^{-1}$) to 380 $\mu$g $l^{-1}$ (July and March) with a mean value of 195 $\mu$g $l^{-1}$ (S.D. ± 123.04). In Waskur lake the maximum concentration of 520 $\mu$g $l^{-1}$ was observed in October, 1981 (Table 17) and the minimum of 20 $\mu$g $l^{-1}$ in December, 1982.

Average iron concentration was higher in Anchar lake. The iron content remained below the detection level in Dal and Waskur lakes for a number of months. From the figure it is observed that the iron content of the investigated lakes fluctuated significantly. The peak values were observed during September (Dal and Waskur) and July and February (Anchar).
Fig. 13: Temporal fluctuations in iron content.

- - - - - Waskur lake
- - - - - Anchar lake
- - - - - D1
- - - - - D2

Dal lake
Table 17: Iron content (μg l\(^{-1}\)) in Waskur lake.

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th></th>
<th>1982</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>XI</td>
<td>XII</td>
<td>I</td>
</tr>
<tr>
<td>1981</td>
<td>520</td>
<td>440</td>
<td>B.D.</td>
<td>80</td>
</tr>
</tbody>
</table>

B.D. = Below the detection level.

The lakes recorded maximum average seasonal values in autumn and minimum during summer (Waskur) and winter (Dal and Anchar).

Ammonical - nitrogen:

Data on ammonical - nitrogen is illustrated in Fig. 14. From the figure it is evident that \(\text{NH}_4-\text{N}\) values in Waskur lake peaked in June and August which was followed by a sharp decline and then steady increase till February. Thereafter, the values again decreased. Anchar lake also followed more or less the same trend with peak registered in August. In Dal lake the values remained low in comparison to other lakes.

Minimum (4.9 μg l\(^{-1}\)) and maximum (48.0 μg l\(^{-1}\)) values for Anchar lake were recorded in April and August (\(\bar{x} : 15.91\); S.D. ± 13.57) and for Waskur lake the low
Fig. 14: Time variations in Ammonical - nitrogen

- Anchar lake
- Waskur lake
- Dal lake

D1
D2
value of 1.4 μg l⁻¹ (Table 18) was observed in December, 1981 and high (60 μg l⁻¹) in August, 1982 (\( \bar{x} : 15.39 \); S.D. ± 15.34). The range for sites D₁ and D₂ was 3.8 - 16.4 μg l⁻¹ (\( \bar{x} : 9.44 \); S.D. ± 4.72) and 0.7 - 27.2 μg l⁻¹ (\( \bar{x} : 10.08 \); S.D. ± 7.87) respectively. The values peaked in September (D₁) and November (D₂) and dipped during October (D₂) and March (D₄). The average ammonia concentration in Anchar lake was higher by 0.52 μg l⁻¹ and 6.15 μg l⁻¹ over the values registered for Waskur and Dal lakes. The maximum average seasonal content was observed in summer (Waskur) autumn (D₁) and winter (D₂ and Anchar) and the minimum in spring.

Table 18: Variations in Ammonial - nitrogen content (μg l⁻¹) of Waskur lake.

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th></th>
<th></th>
<th>1982</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>1981</td>
<td>XX</td>
<td>1982</td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>IV</td>
</tr>
<tr>
<td>-----</td>
<td>------</td>
<td>---</td>
<td>---</td>
<td>-----</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>X</td>
<td>4.2</td>
<td>37.8</td>
<td>1.4</td>
<td>8.7</td>
<td>7.0</td>
<td>6.7</td>
<td>15.7</td>
</tr>
</tbody>
</table>

Nitrate - nitrogen:

Fig.15 provides comparative data of nitrate-nitrogen of the investigated lakes. It is observed that the values followed similar pattern at all the sites upto
Fig. 15: Fluctuations in nitrate - nitrogen.

- - - - - - Waskur lake
- - - - - - Anchar lake
- - - - - - Dal lake

D1, D2
December. Thereafter, the values suddenly increased in Anchar lake followed by a sharp decline and subsequent increase. The average NO$_3$ - N content of Anchar lake was higher in comparison to Dal and Waskur lakes (Fig. 15 and Table 19).

Table 19: Nitrate - nitrogen content (μg l$^{-1}$) of Waskur lake.

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th></th>
<th>1982</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>XI</td>
<td>XII</td>
</tr>
<tr>
<td>1981</td>
<td>24.3</td>
<td>31.3</td>
<td>15.0</td>
</tr>
</tbody>
</table>

High concentration of NO$_3$ - N at two sites of Dal lake was registered in March and April and the minimum values were observed in December. The nitrate content ranged from 11.6 - 76.5 μg l$^{-1}$ ($\bar{x}$: 47.49 ; S.D. ± 18.46) and 11.0 - 78.8 μg l$^{-1}$ ($\bar{x}$: 47.73 ; S.D. ± 18.69) at D$_1$ and D$_2$ sites. In Anchar lake the low NO$_3$ - N (21.0 μg l$^{-1}$) was recorded in November and high (362.0 μg l$^{-1}$) in May ($\bar{x}$: 90.71 ; S.D. ± 106.49). Minimum (8.1 μg l$^{-1}$) and maximum (90.4 μg l$^{-1}$) values for Waskur lake were registered in December, 1982 and April, 1983 ($\bar{x}$: 33.37 ; S.D. ± 20.77).

Dal and Waskur lakes presented similar seasonal pattern for NO$_3$ - N with maximum in spring and minimum in
winter. On the other hand, in Anchar lake high concentration was recorded in winter and low in autumn.

**Phosphate - phosphorus:**

From the phosphate - phosphorus values of the lake waters it has been observed that there was significant difference in their concentrations (Fig. 16, Table-20). The minimum (1.3 μg l⁻¹) and the maximum (73.3 μg l⁻¹) concentration in Waskur lake was observed during June, 1982 and May, 1983 respectively. Dal lake depicted maximum values in April and May and minimum in June and November, 1982. The ranges were 2.3 - 34.6 μg l⁻¹ (± 11.7) and 0.6 - 51.3 μg l⁻¹ (± 18.2) for D₁ and D₂ sites. In Anchar lake the values were high during December and February with a peak (57.0 μg l⁻¹) observed in March. Minimum value (0.6 μg l⁻¹) was observed in May and June (± 19.41). Orthophosphate concentrations were below the detectable levels in May and September (Waskur) and in October (Dal).

**Table 20: Variations in PO₄-P (μg l⁻¹) in Waskur lake.**

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th>1982</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>XI</td>
</tr>
<tr>
<td>1981</td>
<td>2.6</td>
<td>5.3</td>
</tr>
</tbody>
</table>
Fig. 16: Variations in Orthophosphate content

Waskur lake

Anchar lake

Dal lake
Dal and Waskur lakes showed maximum average seasonal $\text{PO}_4$ concentration of $38.4 \mu g l^{-1}$ and $27.3 \mu g l^{-1}$ in spring. The minimum values of $1.7 \mu g l^{-1}$ and $0.95 \mu g l^{-1}$ were observed in autumn. However, in Anchar lake the maximum and the minimum values of $38.0 \mu g l^{-1}$ and $9.6 \mu g l^{-1}$ were registered during winter and summer.

Total - phosphorus:

Fig. 17 and Table 21 represent variations in the total phosphorus concentration of the lake waters. The average values for the surface waters of Anchar lake were higher in comparison to Waskur and Dal lakes.

**Table 21: Total phosphorus concentration ($\mu g l^{-1}$) of Waskur lake.**

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th>1982</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$X$</td>
<td>$XI$</td>
</tr>
<tr>
<td>1981</td>
<td>46.0</td>
<td>24.6</td>
</tr>
</tbody>
</table>

Phosphorus values for Anchar lake ranged from $18.0$ to $246 \mu g l^{-1}$ ($\bar{x} = 91.4$; S.D. $\pm 63.92$) with low concentration observed in January and high in March. In Waskur lake the range was from $24.6 \mu g l^{-1}$ (November, 1981)
Fig. 17: Temporal variations in total phosphorus.

- Waskur lake
- Anchar lake
- Dal lake.
to 312.6 \mu g \text{l}^{-1} (April, 1983) with a mean value of 71.21
\mu g \text{l}^{-1} (S.D. \pm 68.36). The phosphate concentration was
slightly higher at site D2 in comparison to D1. In former
case the concentration range was between 23.3 \mu g \text{l}^{-1}
(June and January) to 152.6 \mu g \text{l}^{-1} (April) with a mean
value of 71.42 \mu g \text{l}^{-1} (S.D. \pm 45.52) and at D1 site the
range was between 14 \mu g \text{l}^{-1} (June) to 180 \mu g \text{l}^{-1} (April)
(\bar{x}: 60.08; S.D. \pm 49.36). No definite seasonal variation
was recorded for total phosphorus concentration in the
lakes.

Trace elements (mg l^{-1}):

The concentration of Pb, Cu, Zn and Ni is given in
Table 22 (a, b). Hg, Cd and Co were below the detection
level.

For Zn the values ranged from non-detectable levels
to the maximum of 0.5 mg \text{l}^{-1} in Waskur (\bar{x}: 0.38), to 0.51
mg \text{l}^{-1} in Anchar (\bar{x}: 0.44) and site D1 (\bar{x}: 0.40) and
to 0.52 mg \text{l}^{-1} at site D2 of Dal lake (\bar{x}: 0.43).

In case of Pb the values varied from non-detectable
levels to 0.31 mg \text{l}^{-1} in Anchar (\bar{x}: 0.14), 0.56 mg \text{l}^{-1} in
Waskur (\bar{x}: 0.21), 0.35 mg \text{l}^{-1} at site D1 (\bar{x}: 0.20) and
0.7 mg \text{l}^{-1} (\bar{x}: 0.3) at site D2 of Dal lake.
Similarly the values of Cu fluctuated from undetectable levels to 0.17 mg \text{l}^{-1} in Anchar ($\bar{x} : 0.06$), 0.08 mg \text{l}^{-1} at site D$_1$ ($\bar{x} : 0.03$), 0.15 mg \text{l}^{-1} at site D$_2$ of Dal lake ($\bar{x} : 0.03$) and to 0.26 mg \text{l}^{-1} in Waskur lake ($\bar{x} : 0.09$).

The values for Ni ranged from undetectable levels to 0.1 mg \text{l}^{-1} in Waskur ($\bar{x} : 0.06$), to 0.26 mg \text{l}^{-1} in Anchar ($\bar{x} : 0.12$), to 0.13 mg \text{l}^{-1} and 0.2 mg \text{l}^{-1} for the sites D$_1$ ($\bar{x} : 0.09$) and D$_2$ ($\bar{x} : 0.14$) respectively.
Table 22(a): Concentration of trace metals (mg l\(^{-1}\)) in Waskur lake.

<table>
<thead>
<tr>
<th>Month/Year</th>
<th>Pb</th>
<th>Cu</th>
<th>Zn</th>
<th>Ni</th>
</tr>
</thead>
<tbody>
<tr>
<td>October, 1981</td>
<td>0.14</td>
<td>0.11</td>
<td>0.25</td>
<td>N.D.</td>
</tr>
<tr>
<td>November</td>
<td>N.D.</td>
<td>0.01</td>
<td>0.47</td>
<td>0.10</td>
</tr>
<tr>
<td>December</td>
<td>0.20</td>
<td>0.11</td>
<td>0.35</td>
<td>N.D.</td>
</tr>
<tr>
<td>January, 1982</td>
<td>0.17</td>
<td>0.16</td>
<td>0.43</td>
<td>0.03</td>
</tr>
<tr>
<td>February</td>
<td>0.21</td>
<td>0.09</td>
<td>0.19</td>
<td>0.10</td>
</tr>
<tr>
<td>March</td>
<td>0.07</td>
<td>0.06</td>
<td>0.41</td>
<td>N.D.</td>
</tr>
<tr>
<td>April</td>
<td>0.12</td>
<td>0.15</td>
<td>0.32</td>
<td>0.10</td>
</tr>
</tbody>
</table>

N.D. = Not detected.
Table 22(b): Concentration of trace metals (mg l\(^{-1}\))

<table>
<thead>
<tr>
<th>Month/Year</th>
<th>Anchar</th>
<th>Waskur</th>
<th>Dal</th>
<th>Dal</th>
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<tbody>
<tr>
<td></td>
<td>Pb</td>
<td>Cu</td>
<td>Zn</td>
<td>Ni</td>
</tr>
<tr>
<td>May, 1982</td>
<td>0.10</td>
<td>N.D.</td>
<td>0.47</td>
<td>N.D.</td>
</tr>
<tr>
<td>June</td>
<td>0.51</td>
<td>0.17</td>
<td>0.51</td>
<td>0.26</td>
</tr>
<tr>
<td>July</td>
<td>N.D.</td>
<td>0.08</td>
<td>0.42</td>
<td>N.D.</td>
</tr>
<tr>
<td>Aug.</td>
<td>0.17</td>
<td>N.D.</td>
<td>0.39</td>
<td>0.13</td>
</tr>
<tr>
<td>Sept.</td>
<td>0.17</td>
<td>0.07</td>
<td>0.34</td>
<td>N.D.</td>
</tr>
<tr>
<td>Oct.</td>
<td>0.28</td>
<td>N.D.</td>
<td>0.42</td>
<td>0.16</td>
</tr>
<tr>
<td>Nov.</td>
<td>0.24</td>
<td>N.D.</td>
<td>0.42</td>
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<tr>
<td>Dec.</td>
<td>N.D.</td>
<td>N.D.</td>
<td>0.52</td>
<td>0.06</td>
</tr>
<tr>
<td>Jan, 1983</td>
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<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
</tr>
<tr>
<td>Feb.</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
</tr>
<tr>
<td>March</td>
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<td>N.D.</td>
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<tr>
<td>April</td>
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<td>0.02</td>
<td>0.46</td>
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</tr>
<tr>
<td>May</td>
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<td>0.04</td>
<td>0.46</td>
<td>0.13</td>
</tr>
</tbody>
</table>

N.D. = Not detected.