STUDY OF SOME ECOLOGICAL EFFECTS OF FISH REARING IN FLOATING CAGES ON EUPHRATES RIVER WATER, ALONG BABYLON CITY

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Abstract
The present study was done to know some of the physical and chemical effects of floating fish cages in Babil governorate and in collaboration with the Environment Directorate of Babel. The study area included two colonies of floating cages for fish rearing north of Babel governorate (Al-Hindiia dam and Al-Mahaweel district) and samples that taken from each colony were five samples for each cage. The points from which water samples were taken were (before the cage directly, after the cage directly, after 1 km, after 2 km, after 3 km) where the samples were taken for a period of six months from July 1962 to December 2016 with one sample per month. The following laboratory tests were made: temperature, pH, dissolved oxygen DO, Electrical conductivity EC, Total dissolved solids TDS, Calcium (Ca), Potassium (K), Sodium (Na), Chloride. The results showed that there were no significant differences in the values of chemical and physical specifications for (temperature, dissolved oxygen, degree of salinity, total soluble salts, chlorides, calcium, potassium, sodium) for water samples that taken from the points (Before the colony, after the colony, after 1 km, after 2 km, after 3 km) for July 2016. While there was a significant decrease in the values of acidity in the two points (After the colony, after 1 km) compared to the rest of the points. Also, we note a significant decrease in levels of chlorides in the points (after the colony, after 1 km, after 2 km, after 3 km) compared to the point (before the colony). Also the results also indicate that there are no significant differences in all the values of the chemical and physical specifications studied for the month 2016 and the month of September 2016. On the other hand, the results showed a significant increase in chloride levels at the point (after 2 km) compared to the point (after 1 km) for the month of October 2016. The results showed that there were no significant differences in all chemical and physical specifications for November and December of the water samples taken from the points (before the colony, after the colony, after 1 km, after 2 km, after 3 km) For the month of December 2016.

1. Introduction
Fish resources are one of the important developmental fields, because they constitute an important economic source that contributes to raising the value of domestic product. Fisheries also contribute to the development of food industries as well as their contribution to the country's food security (Al-Rawi, 2010). Fish farming means fish rearing in different species, whether saline or fresh water, which are used as human food under strict conditions and under the control of man and in certain areas, whether rearing ponds or cages for the purpose of developing production and stabilization farmer ownership for products (Guide to the environmental requirements of fish farming project in Egypt, 2009). In the last decades of the
20th century spread the practice of fish farming by using floating cages in internal waters all over the world. When 1978 more than 70 freshwater fish were reared empirically it has (Coche, 1978). El Gamal (2001) indicates that rearing of fish in cages in Iraq began in the early eighties in Lake Habbaniyah but was began eventually neglected and abandoned on the commercial production side and was also limited use for research. The rearing of fish in floating cages in general has not started seriously since 2011 and has spread significantly during these few years, especially in the central governorates and in Baghdad as well as in the western governorates, but is in its beginnings in the southern regions. The most fish farming in freshwater in Iraq is common carp fish, where most of the cages are grown on the Tigris and Euphrates Rivers (Lowe et al., 2000). Babil governorate is famous for the spread of fish farming due to its geographical location that close to the Baghdad governorate and the governorates of the Middle Euphrates in one hand and the availability of water on the other hand, and breeders have a lot experience in fish farming that helped them in spread rearing farms in this city. The owners of the farms they work to provide all the requirements of production at the beginning of the season and are raising three types of fish (common carp, carp and herbal carp silver) and favored by the Iraqi consumer (Al-Khafaji, 2007).

2. Materials and Methods

Choosing the study region

The governorate of Babylon was chosen as the most productive governorates of the wealth of fish in Iraq and the selection of Shatt al-Hillah study because it is the main tributary of water in the governorate and there are many projects of floating cages for fish rearing. The study region included two colonies of floating cages to fish rearing north of Babil governorate (Al-Hindia dam and Al-Mahaweel district) and the samples that are taken from each colony were five samples per cage. The points from which water samples were taken.

Before the cage directly, just after the cage, after 1 km from the cage, after 2 km from the cage and after 3 km from the cage whereas the samples were taken for six months for the period from July 2016 to December 2016, and with one sample per month. "The following laboratory checks were carried out.

1) The temperature, pH, dissolved oxygen DO, Electrical conductivity EC and Total dissolved solids TDS were measured on-site by using a portable YSI device to get the most accurate results by getting results directly from the site.
2) Calcium (Ca): Calcium was measured by using a titration method with sodium hydroxide until the color changes to orange. Reagents/NaOH Solution EDTA Solution (0.01M) ammonium purpurate murexide. We take 25 ml of this solute in a conical flask and the volume is complete to 50 ml with distilled water then add 2 ml of NaOH solution (1N), then add the miroxide detector reagent until the color changes to pink. Then we titration for the solution with the EDTA until the color turns to violet.
3) Potassium (K): Potassium component levels were measured by using Flame Photometer (Fig. 3-3) and along the 766 wavelength where the color of the flame is violet. Zeroing the device firstly by using distilled water and the sample is placed in the device to get the result.
4) Sodium (Na): Sodium was measured using Flame Photometer (Fig. 3-3) and wavelength 589 where the flame color is yellow and zeroing the device firstly by using distilled water and the sample is placed in the device to give the result.

Chloride: Chlorides are measured by using the titration method with silver nitrate until the color changes to apricots color. Reagents / silver nitrate 0.014 (melted 2.395 g silver nitrate in 1 liter of water and calibrated with sodium chloride) Potassium chromate We put 25 ml in a flask of sample and complete the volume to 50 ml. Then we put a few drops of potassium chromate and

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then we do titration to it with silver nitrate until the color changes from yellow to apricot color.

3. Results

The results in Table (1) indicated that there are no significant differences in the values of chemical and physical specifications (temperature, dissolved oxygen, salinity, total soluble salts, chlorides, calcium, potassium, sodium) After the colony, after 1 km, after 2 km, after 3 km) for July 2016.

As shown above, there is a significant decrease in acidity values in the two points (after colony, after 1 km) compared to other points. We also note a significant decrease in levels of chlorides in the points (after colony, 1 km, 2 km, 3 km) (Before the colony).

The results in Table (2) indicate that there are no significant differences in all the values of the studied chemical and physical parameters (acidity, temperature, dissolved oxygen, salinity, total soluble salts, chlorides, magnesium, calcium, potassium, sodium) of water samples that taken from the points (before the colony, after the colony, after 1 km, after 2 km, after 3 km) for the month of 2016.

The results in Table (3) indicate that there are no significant differences in the values of the chemical and physical specifications (pH, dissolved oxygen, salinity, total soluble salts, calcium, potassium, sodium) of water samples that taken from the points, After the colony, after 1 km, after 2 km, after 3 km) for the month of September 2016.

On the other hand, the results showed a significant increase in the levels of chlorides at the point (after 2 km) compared to the point (after the colony). There was also a significant increase in magnesium levels in the point (after 2 km) compared to the point (before the colony).

The results in Table (4) indicate that there are no significant differences in the values of chemical and physical specifications (temperature, dissolved oxygen, salinity, total soluble salts, chlorides, calcium, sodium) of water samples taken from the points Colonial, after 1 km, after 2 km, after 3 km) for October 2016.

Also the results showed above, that there was a significant increase in the pH value of the points (after 1 and 2 km) compared to the points before and after the colony. Also, there was a significant increase of the magnesium and calcium in the points (after 1 and 2 km).

The results in Table (5) indicated that there are no significant differences in all the values of the chemical and physical specifications that studied (acidity, dissolved oxygen, temperature, salinity, total soluble salts, calcium, potassium, sodium, magnesium, chlorides) that taken from the points (before the colony, after the colony).

The results in Table (6) indicate that there are no significant differences in all the values of the chemical and physical specifications that studied (acidity, dissolved oxygen, temperature, salinity, total soluble salts, potassium, sodium, magnesium, chlorides) Of the points (before the colony, after the colony, after 1 km, after 2 km, after 3 km) for the month of December 2016.
Table - 1: Values of some physical and chemical specifications of Shatt al - Hillah water for July 2016

<table>
<thead>
<tr>
<th></th>
<th>K</th>
<th>Na</th>
<th>Ca</th>
<th>CL</th>
<th>T.D.S</th>
<th>E.C</th>
<th>D.O</th>
<th>Temp</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before the colony</strong></td>
<td>5.00±0.45a</td>
<td>67.26±0.50A</td>
<td>103.75±5.45A</td>
<td>462.5±5.50 A</td>
<td>731.5±2.25A</td>
<td>1125.5±3.50 A</td>
<td>5.95±0.45 A</td>
<td>30.20±0.20 A</td>
<td>7.21±0.01a</td>
</tr>
<tr>
<td><strong>After the colony</strong></td>
<td>4.60±0.0 A</td>
<td>68.35±1.15A</td>
<td>94.75±0.35 A</td>
<td>314±21 b</td>
<td>732.8±4.85 A</td>
<td>1127.5±7.50 A</td>
<td>5.20±0.0 A</td>
<td>30.20±0.20 A</td>
<td>7.08±0.02 b</td>
</tr>
<tr>
<td><strong>After 1 Km</strong></td>
<td>4.85±0.05 A</td>
<td>70.05±3.85 A</td>
<td>99.95±0.15 A</td>
<td>341.5±69.50 A</td>
<td>731.2±1.30 A</td>
<td>1125.0±2.0 A</td>
<td>5.65±0.05 A</td>
<td>30.75±0.35 A</td>
<td>7.05±0.04 b</td>
</tr>
<tr>
<td><strong>After 2 Km</strong></td>
<td>4.8±0.10 A</td>
<td>70.85±2.75 A</td>
<td>102.70±2 A</td>
<td>322±35 b</td>
<td>729.2±1.95 A</td>
<td>1122.0±3 A</td>
<td>5.65±0.25 A</td>
<td>30.71±0.19 A</td>
<td>7.19±0.005 A</td>
</tr>
<tr>
<td><strong>After 3 Km</strong></td>
<td>4.80±0.40 A</td>
<td>72.90±5 A</td>
<td>99.45±3.85 A</td>
<td>266.5±15.50 b</td>
<td>731.9±2.60 A</td>
<td>1126.0±4 A</td>
<td>6±0.20 A</td>
<td>30.65±0.25 A</td>
<td>7.22±0.02 A</td>
</tr>
</tbody>
</table>

*Similar letters in each column mean no significant differences in average rate.

Table - 2: The values of some physical and chemical specifications of Shatt al - Hilla water for August 2016

<table>
<thead>
<tr>
<th></th>
<th>K</th>
<th>Na</th>
<th>Ca</th>
<th>CL</th>
<th>T.D.S</th>
<th>E.C</th>
<th>D.O</th>
<th>Temp</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before the colony</strong></td>
<td>5.00±0.10a</td>
<td>82.65±2.95a</td>
<td>103.2±5.95a</td>
<td>427±7.0a</td>
<td>668.2±0.2 a</td>
<td>1070.0±0.00a</td>
<td>5.41±0.21a</td>
<td>31.25±0.15a</td>
<td>7.07±0.06a</td>
</tr>
<tr>
<td><strong>After the colony</strong></td>
<td>4.9±0.10a</td>
<td>83.20±1.60a</td>
<td>115.6±14.2a</td>
<td>387.5±3.50a</td>
<td>667.8±3.2 a</td>
<td>1095.0±5.00a</td>
<td>5.50±0.10a</td>
<td>31.30±0.10a</td>
<td>6.95±0.05a</td>
</tr>
<tr>
<td><strong>After 1 Km</strong></td>
<td>4.8±0.1a</td>
<td>83.40±1.8a</td>
<td>133.2±7.60a</td>
<td>444.5±10.5a</td>
<td>667.2±0.1 a</td>
<td>1120.0±0.00a</td>
<td>5.77±0.82a</td>
<td>31.35±0.05a</td>
<td>7.05±0.05a</td>
</tr>
<tr>
<td><strong>After 2 Km</strong></td>
<td>4.9±0.10a</td>
<td>84.65±0.85a</td>
<td>120.5±17.6a</td>
<td>322.5±22.05a</td>
<td>673.1±8.4 a</td>
<td>1100.0±0.00a</td>
<td>5.55±0.65a</td>
<td>31.10±0.10a</td>
<td>7.05±0.05a</td>
</tr>
<tr>
<td><strong>After 3 Km</strong></td>
<td>4.95±0.05a</td>
<td>84.05±0.65a</td>
<td>101.6±2.10a</td>
<td>311.0±19.0a</td>
<td>672.4±4.3 a</td>
<td>1115.0±0.80a</td>
<td>5.70±0.80a</td>
<td>31.45±0.15a</td>
<td>7.00±0.00a</td>
</tr>
</tbody>
</table>

* Similar letters in each column mean no significant differences in average rate.
Table - 3: Values of some physical and chemical specifications of Shatt al-Hilla water for the month of September

<table>
<thead>
<tr>
<th></th>
<th>K (mM)</th>
<th>Na (mM)</th>
<th>Ca (mM)</th>
<th>CL (mg/L)</th>
<th>T.D.S (mg/L)</th>
<th>E.C (mS/cm)</th>
<th>D.O (mg/L)</th>
<th>Temp (°C)</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before the colony</strong></td>
<td>3.80±0.10a</td>
<td>63.40±1.30a</td>
<td>120.1±3.10a</td>
<td>191.50±6.50ab</td>
<td>705.5±0.0a</td>
<td>1055.0±15.0a</td>
<td>5.10±0.10a</td>
<td>30.90±0.10a</td>
<td>7.15±0.05a</td>
</tr>
<tr>
<td><strong>After the colony</strong></td>
<td>4.00±0.10a</td>
<td>64.55±2.85a</td>
<td>116.9±1.85a</td>
<td>143.0±11.0b</td>
<td>704.5±4.65a</td>
<td>1050.0±10.0a</td>
<td>5.50±0.10a</td>
<td>30.85±0.15a</td>
<td>7.10±0.20a</td>
</tr>
<tr>
<td><strong>After 1 Km</strong></td>
<td>3.95±0.05a</td>
<td>66.8±1.70a</td>
<td>117.0±0.0a</td>
<td>172.5±31.5ab</td>
<td>704.1±2.30a</td>
<td>1070.0±0.0a</td>
<td>6.35±1.15a</td>
<td>30.80±0.10a</td>
<td>7.00±0.10a</td>
</tr>
<tr>
<td><strong>After 2 Km</strong></td>
<td>3.65±0.25a</td>
<td>66.15±1.75a</td>
<td>116.0±2.25a</td>
<td>212.50±12.5a</td>
<td>701.5±0.90a</td>
<td>1075.0±25.0a</td>
<td>5.50±0.60a</td>
<td>31.0±0.20a</td>
<td>7.25±0.05a</td>
</tr>
<tr>
<td><strong>After 3 Km</strong></td>
<td>3.95±0.50a</td>
<td>67.25±1.15a</td>
<td>118.4±4.65a</td>
<td>160.0±4.00ab</td>
<td>695.9±10.2a</td>
<td>1075.0±22.5a</td>
<td>6.25±0.45a</td>
<td>30.95±0.15a</td>
<td>7.25±0.05a</td>
</tr>
</tbody>
</table>

* Similar letters in each column mean no significant differences in average rate.

Table - 4: Values of some physical and chemical specifications of Shatt al-Hillah water for October 2016

<table>
<thead>
<tr>
<th></th>
<th>K (mM)</th>
<th>Na (mM)</th>
<th>Ca (mM)</th>
<th>CL (mg/L)</th>
<th>T.D.S (mg/L)</th>
<th>E.C (mS/cm)</th>
<th>D.O (mg/L)</th>
<th>Temp (°C)</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before the colony</strong></td>
<td>4.35±0.05c</td>
<td>81.75±1.55a</td>
<td>109.3±1.60a</td>
<td>115.35±4.55a</td>
<td>747.5±2.50a</td>
<td>114.5±2.5a</td>
<td>9.35±0.05a</td>
<td>24.65±0.05a</td>
<td>7.05±0.05c</td>
</tr>
<tr>
<td><strong>After the colony</strong></td>
<td>4.70±0.00abc</td>
<td>85.20±0.10a</td>
<td>111.85±2.05a</td>
<td>110.85±0.15a</td>
<td>746.0±2.00a</td>
<td>1141.5±1.50a</td>
<td>9.00±0.10a</td>
<td>24.65±0.05a</td>
<td>7.00±0.00a</td>
</tr>
<tr>
<td><strong>After 1 Km</strong></td>
<td>5.05±0.05a</td>
<td>83.25±1.35a</td>
<td>111.8±2.05a</td>
<td>115.35±3.25a</td>
<td>747.5±1.5a</td>
<td>1143.5±1.50a</td>
<td>8.95±0.85a</td>
<td>24.65±0.05a</td>
<td>7.15±0.05bc</td>
</tr>
<tr>
<td><strong>After 2 Km</strong></td>
<td>4.95±0.05ab</td>
<td>83.70±0.0a</td>
<td>111.4±0.70a</td>
<td>120.7±0.40a</td>
<td>746.5±0.50a</td>
<td>1146.0±1.00a</td>
<td>9.25±0.45a</td>
<td>24.75±0.15a</td>
<td>7.25±0.05ab</td>
</tr>
<tr>
<td><strong>After 3 Km</strong></td>
<td>4.55±0.25bc</td>
<td>81.35±1.45a</td>
<td>109.9±1.35a</td>
<td>112.4±9.10a</td>
<td>744.0±2.00a</td>
<td>1141.0±1.00a</td>
<td>9.35±0.05a</td>
<td>24.75±0.10a</td>
<td>7.35±0.05a</td>
</tr>
</tbody>
</table>

* Similar letters in each column mean no significant differences in average rate.
**Table - 5: The values of some physical and chemical specifications of the waters of Shatt al-Hillah for the month of November**

<table>
<thead>
<tr>
<th></th>
<th>K</th>
<th>Na</th>
<th>Ca</th>
<th>CL</th>
<th>T.D.S</th>
<th>E.C</th>
<th>D.O</th>
<th>Temp</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before the colony</td>
<td>5.40 ± 0.40a</td>
<td>88.95 ± 0.15a</td>
<td>89.70 ± 8.58a</td>
<td>265.0 ± 24.0a</td>
<td>736.4 ± 1.95a</td>
<td>1065.5 ± 1.50a</td>
<td>8.45 ± 0.25a</td>
<td>14.70 ± 0.10a</td>
<td>7.15 ± 0.05a</td>
</tr>
<tr>
<td>After the colony</td>
<td>5.10 ± 0.10a</td>
<td>87.95 ± 0.35a</td>
<td>90.45 ± 3.15a</td>
<td>252.5 ± 30.5a</td>
<td>738.0 ± 3.55a</td>
<td>1065.5 ± 1.50a</td>
<td>8.55 ± 0.15a</td>
<td>14.75 ± 0.15a</td>
<td>7.10 ± 0.20a</td>
</tr>
<tr>
<td>After 1 Km</td>
<td>5.10 ± 0.10a</td>
<td>89.10 ± 0.0a</td>
<td>95.94 ± 2.34a</td>
<td>253.0 ± 12.0a</td>
<td>738.4 ± 0.0a</td>
<td>1071.0 ± 6.50a</td>
<td>7.80 ± 0.10a</td>
<td>14.70 ± 0.10a</td>
<td>7.00 ± 0.10a</td>
</tr>
<tr>
<td>After 2 Km</td>
<td>5.00 ± 0.10a</td>
<td>89.95 ± 2.25a</td>
<td>99.06 ± 2.34a</td>
<td>251.0 ± 9.00a</td>
<td>728.6 ± 11.7a</td>
<td>1072.5 ± 7.50a</td>
<td>8.29 ± 0.50a</td>
<td>14.70 ± 0.10a</td>
<td>7.25 ± 0.05a</td>
</tr>
<tr>
<td>After 3 Km</td>
<td>5.00 ± 0.10a</td>
<td>87.15 ± 0.85a</td>
<td>101.4 ± 1.56a</td>
<td>256.0 ± 21.0a</td>
<td>733.5 ± 4.20a</td>
<td>1067.5 ± 0.50a</td>
<td>8.39 ± 0.40a</td>
<td>14.90 ± 0.0a</td>
<td>7.25 ± 0.05a</td>
</tr>
</tbody>
</table>

* Similar letters in each column mean no significant differences in average rate.

**Table - 6: Values of some physical and chemical specifications of water Shatt al-Hillah for the month of December**

<table>
<thead>
<tr>
<th></th>
<th>K</th>
<th>Na</th>
<th>Ca</th>
<th>CL</th>
<th>T.D.S</th>
<th>E.C</th>
<th>D.O</th>
<th>Temp</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before the colony</td>
<td>4.50 ± 0.0a</td>
<td>85.90 ± 1.00a</td>
<td>81.85 ± 2.35a</td>
<td>265.0 ± 24.0a</td>
<td>692.5 ± 0.95a</td>
<td>1065.5 ± 1.50a</td>
<td>8.45 ± 0.25a</td>
<td>14.25 ± 0.11a</td>
<td>7.91 ± 0.11A</td>
</tr>
<tr>
<td>After the colony</td>
<td>4.20 ± 0.10a</td>
<td>84.90 ± 3.30a</td>
<td>87.30 ± 0.00a</td>
<td>262.5 ± 20.50a</td>
<td>692.5 ± 0.95a</td>
<td>1065.5 ± 1.50a</td>
<td>8.15 ± 0.15a</td>
<td>14.25 ± 0.05a</td>
<td>7.85 ± 0.05A</td>
</tr>
<tr>
<td>After 1 Km</td>
<td>4.45 ± 0.25a</td>
<td>85.00 ± 1.70a</td>
<td>87.35 ± 1.55a</td>
<td>253.0 ± 12.0a</td>
<td>696.4 ± 4.25a</td>
<td>1071.5 ± 6.50a</td>
<td>7.80 ± 0.10a</td>
<td>14.35 ± 0.15a</td>
<td>7.95±0.15 A</td>
</tr>
<tr>
<td>After 2 Km</td>
<td>4.35 ± 0.05a</td>
<td>85.85 ± 1.55a</td>
<td>87.30 ± 0.0a</td>
<td>251.0 ± 9.00a</td>
<td>697.1 ± 4.90a</td>
<td>1072.5 ± 7.50a</td>
<td>8.29 ± 0.50a</td>
<td>14.55 ± 0.35a</td>
<td>7.97±0.03 A</td>
</tr>
<tr>
<td>After 3 Km</td>
<td>4.30 ± 0.10a</td>
<td>86.00 ± 0.20a</td>
<td>86.50 ± 3.90a</td>
<td>256.0 ± 21.0a</td>
<td>693.8 ± 0.35a</td>
<td>1067.5 ± 0.50a</td>
<td>8.39 ± 0.40a</td>
<td>14.35 ± 0.05a</td>
<td>7.98±0.08 A</td>
</tr>
</tbody>
</table>

Similar letters in each column mean no significant differences in average rate.
4. Discussion

Hydrogen Ion Concentration

From the observation (Table 1, 2, 3, 4, 5 and 6), the pH values in this study are within a narrow range, due to the large presence of carbonate and bicarbonate ion that act as Buffer action which prevents the change in hydrogen ion concentration (Scott, 2000). The results of the study also show that the water of the Euphrates River passing through Babylon falls within the light base direction. This is consistent with previous studies conducted on Iraqi inland waters such as Rasheed and his group (2001) 7.54 - 8.85. Al-Saadi (2006) mention that Iraqi waters is base water and the degree of pH is ranging mostly 7 - 8.2. The current study showed that the pH values of the study sites located within the normal range of the Euphrates River, except for the value recorded in October 4, and may be a temporary decrease resulting from a reduction in the process of photosynthesis, which leads to a rise in the values of carbon dioxide, which leads to a reduction in pH values or because the decay of carbon dioxide through decomposition of organic material and respiratory process of marine biology (Al-Saadi, 2006).

The current study indicates that fish cages none of the factors affecting the imbalance of hydrangean in the Euphrates River that passing through Babil Governorate and it's pH of the cages is within the permissible limits (Ministry of Health, 1998).

The Heat

The results of the current study correspond to most of the environmental studies of Iraqi water, we note from (Table 1,2,3,4,5,6) that the temperature did not register significant differences and this corresponds with Al-Zarafi and his group, water mixing and homogenization factors in and after cages have a significant effect on temperature adjustment and located within the permissible limits (less than 35 m depending on the parameters of the pollution maintenance system of the rivers (Ministry of Health, 1998).

Dissolved Oxygen & Biological Oxygen Demand

The highest value of oxygen was recorded in October and its lowest was recorded in the summer months. The results of the present study were consistent with the results of the Al-Jubouri study (2005) 6.95-0.20 mg / L. This may be due to the low level of river slope in these areas and the rapid flow of water in the area of study (SIPAM, 2006). The current study shows that the recorded values of dissolved oxygen in water are appropriate in the Euphrates river and confirm that the floating fish cages at the four sites are not factors that cause the lack or depletion of oxygen in the river.

Total Suspension Solids

The current study shows that there are in the concentration of suspended solids between the study sites for the months of July, August, September, and December, and this is consistent with (FAO, 2006). Which confirmed that the increase in the suspended solids and the increase in organic matter suspended in the cages decreased by 45% after the cages directly at a distance of 3 meters in the waters of the rivers as a result of the dispersion acts and mixing and spread of water. The current study shows that the high concentrations of suspended solids, which are produced from inside the fish cages, decrease significantly after the cages directly, and may be due to the drift of the water of the agricultural lands loaded with clay and the release of industrial water containing high concentrations of suspended materials to the Euphrates River passing through Babylon table (1, 3.6) (Rasheed, 2001). (Table 2.4.5) shows that there is no difference in the concentration of suspended solids for the months of August, November, and November, which may be due to lower river levels, slower river flow, increased the evaporation processes and poor rains, Abawi and Hassan, 1990). This is confirmed by Al-Azzawi (2008). When comparing the values of the suspended solids concentrations of the first station in each site with the determinants of the Iraqi River Conservation System No. 25 of 1967.
Calcium

The present study showed that water in the study sites is difficult. Such results were reached by Al-Tamimi (2004) in his study on the Tigris River, where the concentration of calcium was 72-185 mg/L. It is also apparent that there is a significant difference in the calcium values of the study sites. The reason may be due to the geographical and geological differences of the sites and the difference in the quantities of calcium and its materials that they receive (Al-Saadi and his group, 2000). It also shows a significant difference in the monthly values of the site. This is due to the seasonal variations in calcium concentrations (1990 and 1990), indicating that fish cages are not factors that affect calcium concentrations in the Euphrates River passing through Babylon city.

Sodium

The values of the four sites were consistent with Al-Saadi and his group (1999) on the Tigris River at 9.2 - 90 mg/L. The difference was due to the small size of the biomass in the fish cages, while there were significant differences in sodium values during the months following the study in the sites, as well as the existence of significant monthly differences between the study stations for each site. This may be due to differences in concentrations of sodium in water due to the irrigation and runoff activities of adjacent lands resulting from rain and temperature variations (Gillard & Boustead, 2005).

5. Conclusions

a) The water of the cages in the studied sites is moderate, well ventilated, fresh, light base, and basal to the base of the bicarbonate ion, mainly concentrated, heavy and low pollution in heavy metals.

b) The physical and chemical factors studied on the effect of floating fish cages that floating the waters of the Tigris River is appropriate and were not affected and remained within the safe borders.

c) Nutrient values in floating fish cage water were within the allowable concentrations of FAO (FAO, 1992). So, it within safe limits.

6. Reference


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