# INTERRELATIONSHIPS AMONG PHYSICAL PARAMETERS IN OVIA RIVER, NIGER DELTA, NIGERIA

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## ABSTRACT
*The physical parameters of Ovia River in Benin City, Edo State of Nigeria were studied for a period of 2 years (January-December) of 2005 and 2006. Fluctuations in physical parameters at the study stations were irregular throughout the study period. Transparency level ranged from 32.46±7.62 (September) to 116.2 ±6.20 (February) in 2005 and 42.88±4.16 (May) to 132.58±17.45 (February) in 2006. Water temperature varied from 25.50±0.52 (August) to 29.58±0.79 (April) in 2005 and 25.50±0.52 (August) to 29.92±0.29 (March) in 2006. Air temperature ranged from 24.88±3.39 (December) to 31.58±2.09 (March) in 2005 and 24.25±0.87 (July) to 30.75±1.86 (March) in 2006. Monthly rainfall ranged from 2.0±0.00 (January) to 664±0.00 (July) in 2005 and 2.0±0.00 (December) to 358±0.00 (September) in 2006. No significant difference (P>0.05) was recorded among stations except in air temperature which revealed significant difference (P<0.05) in both years. However, significant differences (P<0.05) was recorded in all parameters for both seasons except in the air temperature which was not significantly different (P>0.05) in 2005. In conclusion, the results obtained from this study fall within the acceptable range and is suitable for the biological life/existence of prawn hence their abundance in time and season.*
**Keywords:** Physical parameters, prawns, Freshwater

## INTRODUCTION

The lower reaches of tropical rivers contain appreciable number of decapods crustaceans. In West Africa, the groups extending into freshwater are the Atyid, Palaemonid, apheid shrimps, sesamine and camptandriine crabs (Jonathan and Powell, 1989). Prawns have been reported to be of immense commercial value in Nigerian territorial waters. They are found in most inland freshwater bodies including lakes, swamps, irrigation ditches, canals and ponds as well as in estuaries (Bello-Olusoji, *et al.* 2004). The hydrology of Nigerian fresh water bodies has been widely studied and the methods documented. The available data on the physico-chemical hydrology of natural inland waters of Nigeria include the hydrology and plankton of River Sokoto (Holden and Green, 1960), Eleiyele reservoir (Imevbore, 1965), River Oshun (Egborge, 1971), River Ethiope (Dode, 1992, Odum, 1992), Warri River (Egborge and Benka- Coker, 1986) and (Chukwogo, 1990). However, there is dearth of information on physical parameters of Ovia River. This study was therefore initiated to obtain relevant biological and ecological information on this prawn habitat to assist in proper sustainable management of this aquatic resource.

## MATERIALS AND METHODS

The study area is a stretch of the Ovia River from four locations viz: Costain (Lat 06 $^{0}$ 35$^{1}$; Log. 05 $^{0}$ 29$^{1}$), Iguoriakhi (Lat. 06 $^{0}$ 28$^{1}$; Log. 05 $^{0}$ 27$^{1}$), Ikoro (Lat. 06 $^{0}$ 16$^{1}$; Log. 05 $^{0}$ 27$^{1}$),Ekenwan (Lat. 06 $^{0}$ 13$^{1}$; Log. 05 $^{0}$ 28$^{1}$) (Fig. 1).The River is located within the tropical climate with proportionate dry and wet (rainy) seasons with the vegetation mainly evergreen forest making it suitable for farming. The River originates from Owan in Ovia North East Local Government and flows through several towns and villages. Water samples were collected from each of the four sampling locations with 1 litre plastic bottle immersed below the surface of the water and transported to the laboratory for subsequent analysis. Air and water temperature and transparency were determined insitu using 76mm Mercury -in- glass thermometer and secchi disc respectively. Rainfall data was obtained from Osse River Estates Limited Meteorological Services Department. Data obtained was presented in descriptive statistics using charts and graphs and subjected to One-way analysis of variance (ANOVA) in a randomized complete block design (RCBD) and means were separated using Duncan Multiple at 5% level of probability using SPSS version 16.0 for windows.

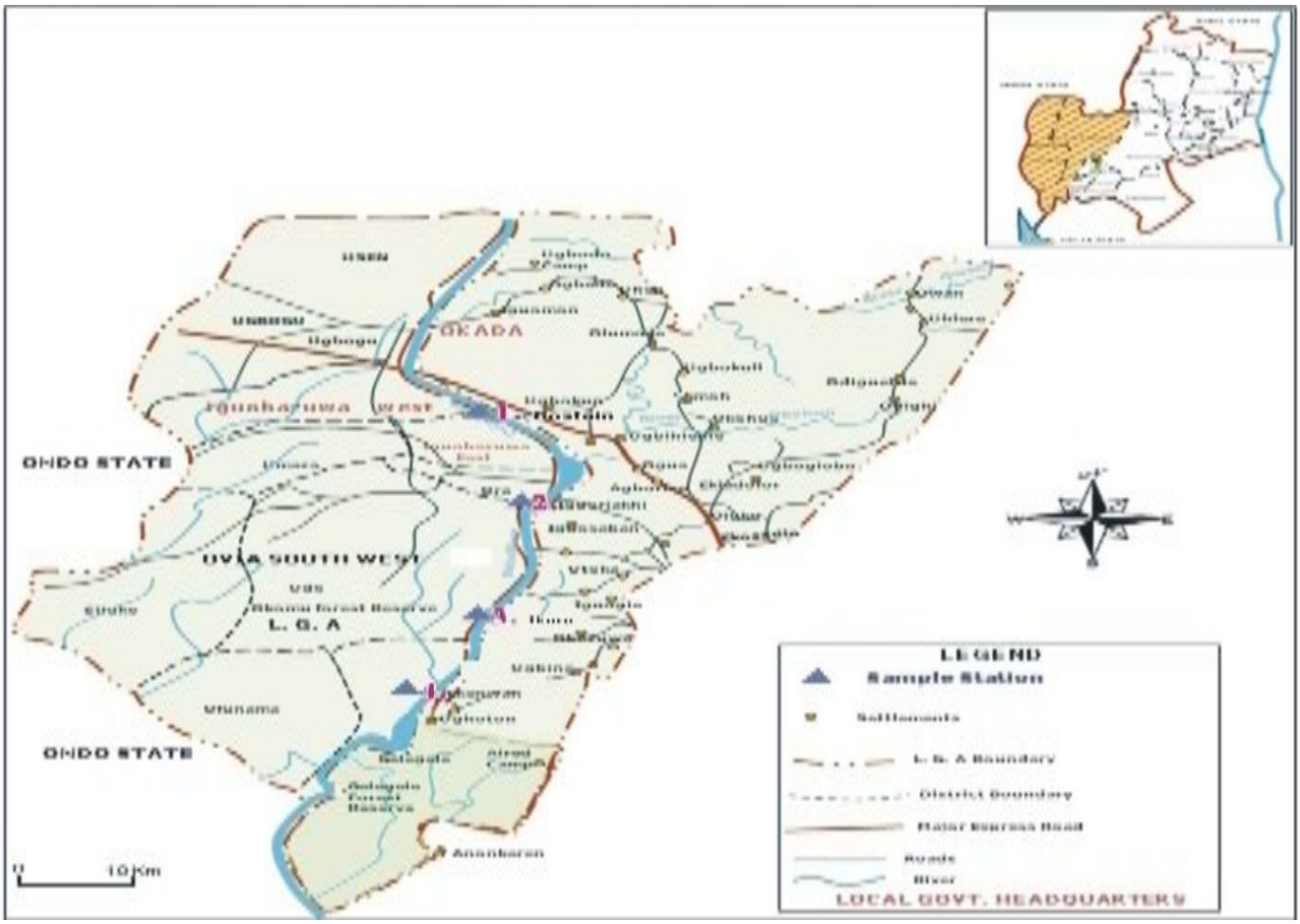


**Fig 1: Map of Edo State showing the location of study stations**
***Source: Edo State Ministry of Land and Survey, 2010***

## RESULTS

The monthly physical parameters in Ovia River for the study period are presented in Tables 1a, 1b, 2a, 2b and Fig 2-5. Fluctuations in physical parameters at the study stations were irregular throughout the study period. There was no significant difference (P>0.05) in the transparency, water temperature among the stations in both years but the latter was significantly (P>0.05) varied with season in both years. Air temperature among stations was significantly different (P<0.05) in both years with highest 30.04±3.06 in station 1 and the least 27.75±3.24 station 4 in 2005 and the highest 30.75±1.86 in station 1 and least 30.75±1.86 in station 4 in 2006 and varied significantly (P<0.05) with season only in 2006 There was no significant difference (P>0.05) in the rainfall among stations in both years However, seasonal variations showed significant difference (P<0.05) in both years with the highest 265.21±193.44 and 247.57±85.85 both in the rainy season.

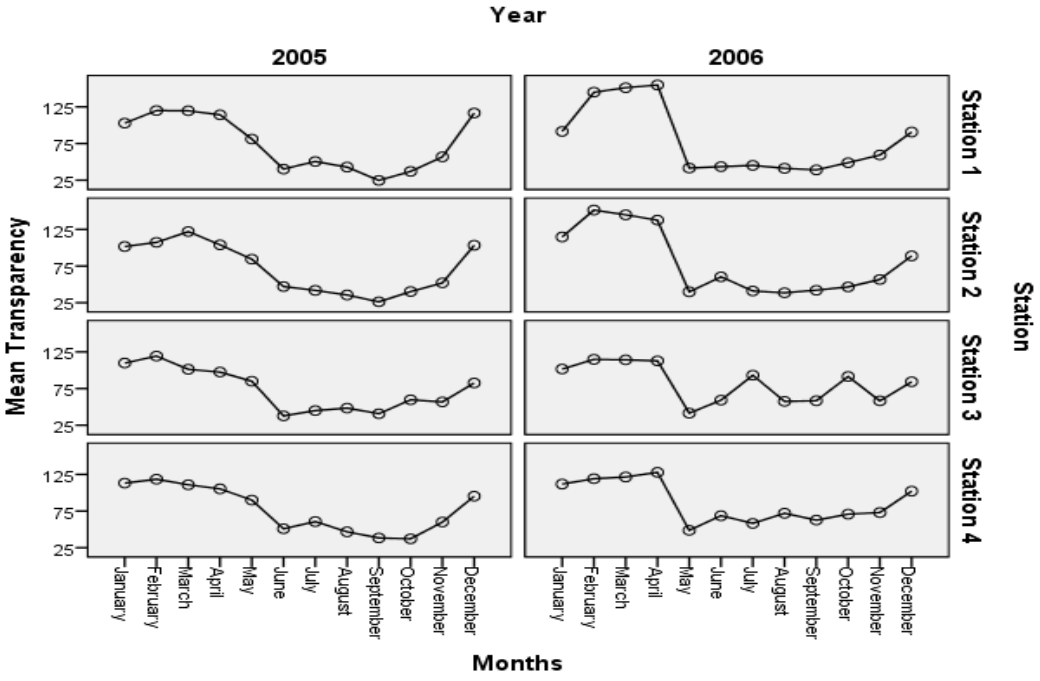


**Fig 2: Monthly Variation in the mean transparency from January-December for each year**

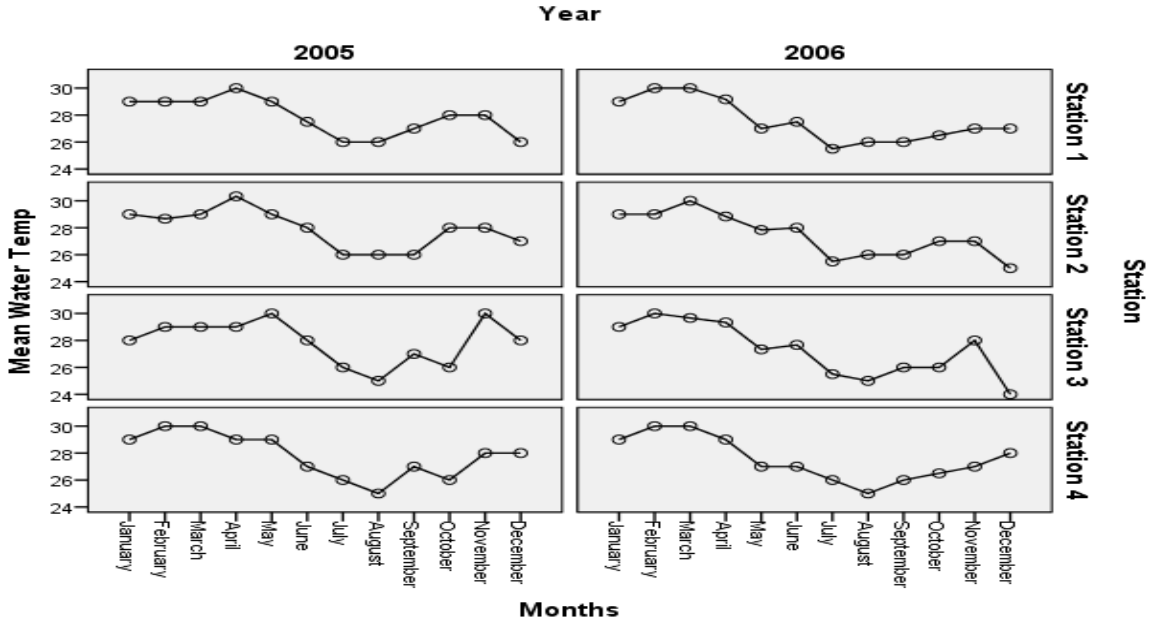


**Fig 3: Monthly variation in the mean Water temperature from January-December for each year**

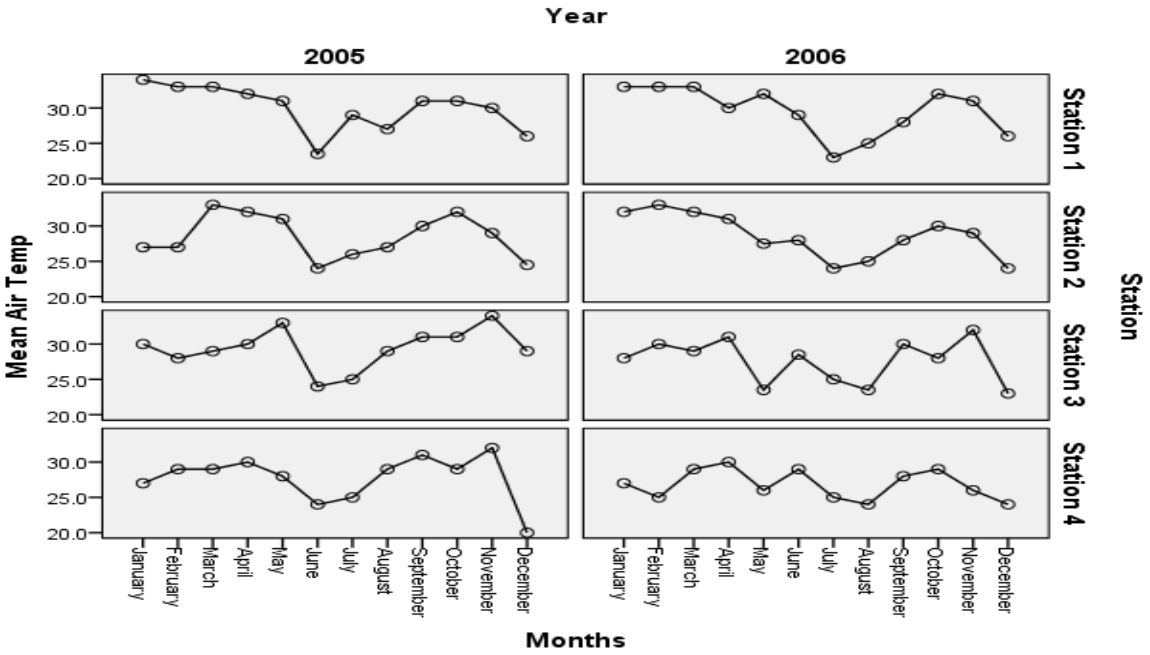


**Fig. 4 Monthly variation in the mean Air temperature from January-December for each year**

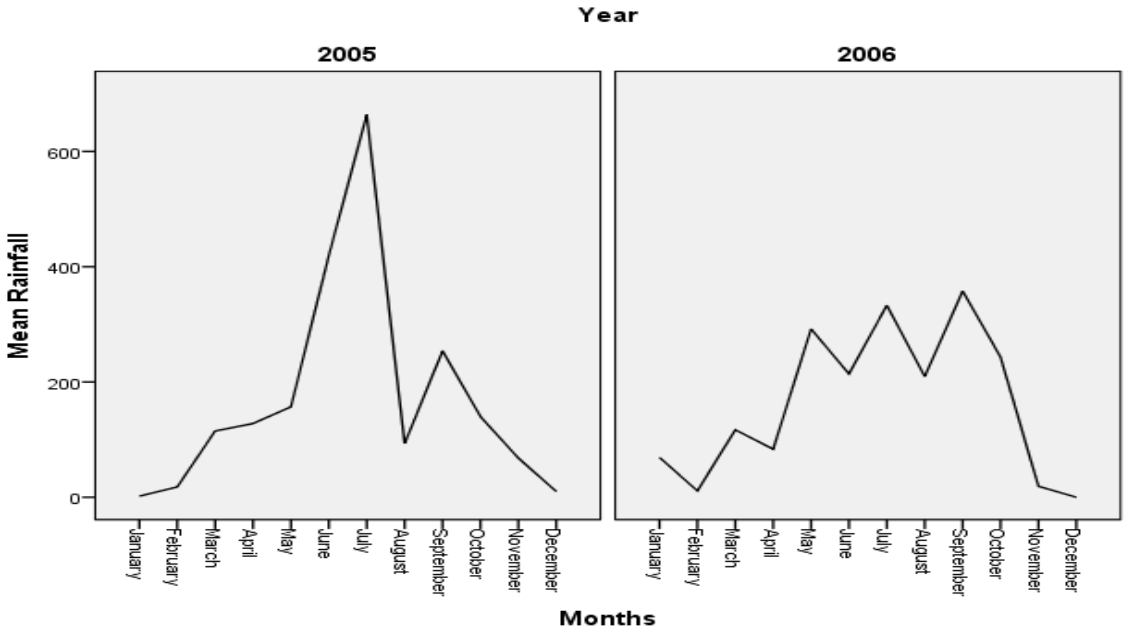


**Fig 5: Monthly variation in the mean Rainfall from January-December for each year**

**Table 1a: Some Physical parameters of Ovia River study stations in 2005**

| | **Station 1** | **Station 2** | **Station 3** | **Station 4** | |
|---|---|---|---|---|---|
| | **Mean±SD** | **Mean±SD** | **Mean±SD** | **Mean±SD** | **ANOVA** |
| Transparency | 75.54±36.23 | 72.11±33.68 | 73.65±28.22 | 77.24±30.39 | >0.05 |
| Water Temp | 27.88±1.34 | 27.92±1.40 | 27.92±1.57 | 27.83±1.59 | >0.05 |
| Air Temp | 30.04±3.06$^{a}$ | 28.54±2.97$^{bc}$ | 29.42±2.79$^{ab}$ | 27.75±3.24$^{c}$ | <0.05 |
| Rainfall | 172.46±188.05 | 172.46±188.05 | 172.46±188.05 | 172.46±188.05 | >0.05 |

**∗Year=2005**

∗Means in the same row with the same superscript are not significantly different (P>0.05)

**Table 1b: Some Physical parameters of Ovia River study stations in 2006**

| | **Station 1** | **Station 2** | **Station 3** | **Station 4** | |
|---|---|---|---|---|---|
| | **Mean±SD** | **Mean±SD** | **Mean±SD** | **Mean±SD** | **ANOVA** |
| Transparency | 79.31±45.23 | 80.18±43.85 | 82.26±26.33 | 86.38±27.35 | >0.05 |
| Water Temp | 27.56±1.54 | 27.43±1.55 | 27.29±1.94 | 27.54±1.60 | >0.05 |
| Air Temp | 29.58±3.32$^{a}$ | 28.63±3.04$^{ab}$ | 27.63±3.03$^{bc}$ | 26.83±2.06$^{c}$ | <0.05 |
| Rainfall | 162.42±125.04 | 162.42±125.04 | 162.42±125.04 | 162.42±125.04 | >0.05 |

**∗Year=2006**

∗Means in the same row with the same superscript are not significantly different (P>0.05)

**Table 2a: Seasonal variation of physical parameters of Ovia River in 2005**

| Parameters | Season | | |
|---|---|---|---|
| | **Dry Season** | **Wet Season** | **p-value** |
| Transparency | 98.51±23.36[a] | 57.58±25.88[b] | .000 |
| Water Temp | 28.58±0.98[a] | 27.39±1.56[b] | .000 |
| Air Temp | 29.18±3.43[a] | 28.77±2.87[a] | .441 |
| Rainfall | 42.60±43.26[b] | 265.21±193.44[b] | .000 |

∗**Year=**2005, **Dry** = November-March, **Rainy** = April-October
∗Means in the same row with the same superscript are not significantly different (P>0.05)

**Table 2b: Seasonal variation of physical parameters of Ovia River in 2006**

| Parameters | Season | | |
|---|---|---|---|
| | **Dry Season** | **Wet Season** | **p-value** |
| Transparency | 104.74±29.57[a] | 65.81±32.15[b] | .000 |
| Water Temp | 28.38±1.72[a] | 26.79±1.24[b] | .000 |
| Air Temp | 28.95±3.35[a] | 27.61±2.71[b] | .009 |
| Rainfall | 43.20±44.19[b] | 247.57±85.85[b] | .000 |

∗**Year=**2006, **Dry** = November-March, **Rainy** = April-October
∗Means in the same row with the same superscript are not significantly different (P>0.05)

## DISCUSSION

The pattern of the physical conditions obtained for Ovia River follows the trend obtained for some other tropical rivers (Ogbeibu, 1991). Water transparency of Ovia River showed distinct seasonal variation. Higher values were recorded in the dry season months which tend to reduce during the rains, which can be attributed to increased input of particulate organic debris through surface runoff while high transparency during the dry season may

be due to sedimentation of suspended solids and decrease in the input of surface run-off. Omoigberale (2005) made similar observations on his assessment of water quality of River Osse. Suspended solid load greatly determines transparency in an inverse relationship. The rainy season recorded lower values than the dry season months and this could be attributed to the allochthonous materials from various creeks and runoff into the river or as a result of the impact of logging and increased traffic on the river into the Ekenwan village where a market is situated and most communities situated around the locality sell off their products. When they are compared to the maximum acceptable level of 5.0 – 25cm and 25 – 40cm (FEPA, 1990 and New, 2002 respectively), the results fell within the acceptable range.

Surface water temperature followed the ambient air temperature and is influenced by substrate composition, turbidity, vegetation cover, run-off, and inflow and heat exchange with the air (Bishop, 1973, Egborge, 1972). Temperature has been shown to be one of the factors that affect the rate of settling of particles in suspension (Jackson, 1964). The temperature was relatively high when compared to the monthly average temperature recorded by Bello-Olusoji (2007) for *C. Africana* ($23.31^0$C) and *M.vollenhovenii* ($25.74^o$C) at Erin-Ijesha waterfalls. Water temperature affects the activity, behavior, feeding, growth and reproduction of all aquatic animals (Dupree and Hunner, 1984). Jose (1980) stated that *M. rosenbergii* preferred thriving at a temperature range of 23 – $25^o$C while Chank *et al.* (1992), indicated $26^o$C-$29^o$C as the desirable temperature range for the development of *M. rosenbergii* embryo. The air and water temperature recorded throughout the year for this study was relatively constant between 27.29 and 29.81. The air temperature showed distinct seasonal variations, with mean monthly temperature values being higher in the dry season months than the rainy season months except in station 4 where the values was higher in the rainy season months.

This condition is typical of tropical weather (Ikusemiju, 1981; Omoigberale, 2005). The lower air temperature in the rainy season months were probably due to the cold winds of the rainy season months as Egborge (1994) also made similar

deductions. The surface water temperatures were generally lower than ambient air temperature. There was little or no variation from station to station and they followed the air temperature pattern. This condition is typical of most Nigerian water bodies (Omoigberale and Ogbeibu, 2006; Ogbeibu, 1991 and Omoigberale (2005) recorded similar observations in their studies at Ikpoba and Osse rivers respectively. In the tropics, water temperature is dependent on the amount of iridescence received by the water body daily. This is modified by cloud cover, river flow and tidal changes, thus leading to daily fluctuations (Oyewo, *et al.,* 1982).

**CONCLUSION**

In conclusion, physical parameters of the aquatic environment are very important *factors* affecting the biological life in the aquatic system and most importantly determine the production, abundance in time and season. The results obtained from this study fall within the acceptable range. Thus, the physical parameters in Ovia River are suitable for the biological life/existence of prawn.

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