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Physico-chemical conditions and distribution of phytoplankton in the Brass River, Nigeria

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ABSTRACT: The physiology, physico-chemical conditions and distribution of phytoplankton in the Brass River, Nigeria has been assessed. The data on physico-chemical conditions revealed a near constant water surface conditions for all the stations sampled. The relative abundance of phytoplankton population of the Brass River system revealed the presence of the following marine phytoplankton families Bacillariophyceae (*Bidulphia auria, M. mobiliencesis, B. sinsensis, Skeletonema costatum*), Chlorophyceae(*Halosphaera ividis*), and Dinophyceae (*Ceeratium sectum*). @JASEM

Phytoplankton are small free floating algae which, which contribute to the total suspended plant and animal cells of both fresh and salt water and are the basis of food chain in these environment. The Brass River is a tributary of the Nun River in the Niger Delta area of Nigeria. There is a paucity of literature on the surface waters of the Brass River system especially on the relative abundance of phytoplankton population (Biney *et al.*, 1994). The Brass River is one of the important tributaries of the River Nun (Nyananyo, 1999). Studies on water bodies in the West African sub region points to the fact that a lot of research is needed on them (Lawson, 1960; Green, 1962 and Imevbore, 1965). The present investigation is aimed at increasing the data on phytoplankton in the Brass River and consequently to West African water bodies.

MATERIALS AND METHODS

Description of study area: The Brass River is one of the tributaries of the River Nun in the central cartographic Niger Delta (Nyananyo, 1999, 2002). The cartographic Niger Delta is Africa's largest delta covering some 7,000 square kilometers. About one third of this area is made up of wetlands, and it contains the largest mangrove forest in the world, 5,400-6,000 square kilometres (Afolabi, 1998; Nyananyo, 1999, 2002). The mangrove swamps which are also vegetated tidal flats are sandwiched between the outer barrier island complex and the older sands of the Benin formation (Oyegun, 1999) The evolution of these tidal flats are primarily through the process of repeated bifurcation of the Niger-Benue river system which breaks up into tributaries at Ebu ito (Nyananyo, 1999, 2002). A reticulate drainage pattern characterizes the tidal flats of the Brass River. This drainage pattern is due mainly to the higher elevation at the edges than at the centre of the flats (Allen, 1965). The vegetated tidal flats are composed of three elements:

1. the main feeding channels which derive from fresh water sources en route to the sea.
2. smaller channels which connect them together and
3. elevated tidal flats exposed only at low tide (Oyegun, 1999).

Sample collection and analyses: Six sampling stations were selected within the study area along lines at right angles to the shore.

Physico-chemical parameters: At each station, water samples were taken at the surface and at maximum depth. These were immediately stored in an ice chest. Temperature, depth, pH, and transparency were measured *in situ.* Temperature and pH were measured using field thermometers and the SISS TECHN WERKSTA model D812 WELHEN field pH meters respectively. Transparency and depth of the water at the various stations were measured as follows: -

Transparency: This determination was by the use of a white secci disc to which was attached a calibrated twine. This device was dropped into the river gradually at specified points, and the point at which the white disc was not seen was taken as the limit of light penetrability. This distance was recorded.

Water depth: a weight was attached to a calibrated twine, and dropped into the river at specified points. The point on the twine at which the attached weight made contact with the substratum was taken as the depth of the station in question. This was *recorded.*

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Phytoplankton identification: To assess the composition of primary producer populations each station was sampled for phytoplanktons. Water samples were collected 20 – 30 cm below the surface using a 1 litre Van Dorn water sampler closed by means of a weight messenger dropped along the cable to trip the closing mechanism. A sub sample of 250ml was removed and treated with 5ml Lugol's solution (60 g KI + 40g I_2 crystals, d/w) to stain and preserve the specimens for identification. This 250 ml sub sample was concentrated by allowing the sample to stand for 24 hours. A 1ml sub sample was pitted out at the end of the period into a Sedgenick-Rafter counting chamber. Microscopic identification were made of all sub samples and recorded.

RESULTS AND DISCUSSION

The results obtained from the study are presented in Tables 1 – 5. The temperature variation (Table 1) in the area is not wide, and this could be beneficial to the phytoplanktons within the area. The wide variations in water depth (Table 2) is as a result of selective artisanal fishing activities carried out by the fishermen living in this area, whereas the pH and transparency measurements (Tables 3 and 4) show relatively turbid and acidic levels at stations 1, 4, 5 and 6.

Table 1. Water Temperature (°C) at the various stations

Stations	Range	Mean	Standard deviation
1	28-30	30	29
2	29-35	30	29
3	28-30	29	28
4	29-30	30	30
5	27-28	30	30
6	29-30	35	30

Table 2: Water depth at the various stations (CM)

Stations	Range	Mean	Standard deviation
1	312-320	190	75
2	190-191	190	75
3	75-78	190	75
4	500-510	190	75
5	40-42	190	75
6	35-38	191	75

These areas coincidentally are within the vicinity of the "AGIP" oil company export terminal in Twon-Brass and "SHELL" oil company NEMBE CREEK flow station. It is submitted therefore that effluents from these oil industrial installations could have contributed to the relatively turbid and acidic levels of the water at stations 1, 4 whereas 5 and 6 is not so (Tables 3 and 4). The record of twelve species of phytoplankton distributed amongst three families (Table 5) is note worthy. Phytoplanktons are small free floating algae which contribute to the total suspended plant and animal cells of both fresh and salt water and are the basis of the food chain in these environments (Hill, Popp and Grove, 1980).

Table 3: Water pH at the various stations

Months/year	STN 1	STN 2	STN 3	STN 4	STN 5	STN 6
April 1997	6.93	6.95	7.60	6.40	6.88	5.60
May 1997	6.96	7.02	7.70	6.42	6.88	5.60
June 1997	6.97	7.03	7.86	6.40	6.90	5.58
July 1997	6.68	7.61	6.42	6.36	6.91	5.58
August 1997	6.84	6.79	6.62	6.40	6.86	5.58
September 1997	6.85	6.95	6.88	6.40	6.86	5.60

Conclusions: The results of this study shows that further investigations will be beneficial and the effluent from the oil installations should be properly treated before they are emptied into the Brass River system to ensure that the food chain which eventually lead up to the *Homo sapiens* is not disrupted as this will be catastrophic to the very existence of *Homo sapiens.*

Table 4. Transparency of the water at the various stations (CM)

Months/year	STN 1	STN 2	STN 3	STN 4	STN 5	STN 6
April 1997	17	42	42	45	63	49
	22	63	56	54	72	59
May 1997	17	41	43	44	62	49
	24	62	55	53	70	57
June 1997	18	43	42	44	60	46
	23	63	50	54	71	58
July 1997	19	42	40	45	60	48
	23	63	52	53	71	59
August 1997	19	42	40	45	61	48
	22	62	51	54	72	57
September 1997	19	43	40	46	61	48
	24	61	52	54	71	59

Table 5: Marine Phytoplanktons recorded in the study

1. Family Bacillariophyceae

    Biddulphia aurita
    B. mobiliensis
    B. sinensis
    Coscinodiscus excentricus
    Melosira granulate
    M. islandica
    M. lestans
    Paralia sulcate
    Skeletonema costatum
    Fragiliaria oceanica

2. Family Chlorophyceae

    Halosphaera vividis

3. Family Dinophyceae

    Ceratium setacum

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