Notes on Indicators of Environmental Status in Inshore and Offshore Waters of South -Western Nigeria

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Abstract: This compilation is based on several years of personal and collaborative work on inshore and offshore waters of South West Nigeria. The relevance of algae, polychaetes, juvenile stages, as well as water chemistry in determining environmental status was documented. Nutrient level, dissolved oxygen, biological oxygen demand level and thermocline development are important abiotic factors. [Nature and Science 2010;8(6):62-65]. (ISSN: 1545-0740).

Keywords: pollution indicators, inshore, offshore, phytoplankton, environment.

1. Introduction

The inshore and offshore waters of South West Nigeria are prone to contamination arising from an inefficient or outright non-existent sewage system (Nwankwo, 1986; Ajao,1989) Tidal water recruitment of wood wastes deposited along the lagoon shore at Okobaba (Akpata, 1987; Nwankwo and Akinsoji 1989; Nwankwo,1998) and waste heat generated by gas driven thermal plants washed into the shores of Lagos Lagoon at Egbin (Nwankwo et al, 2008). There are land based diffuse sources of contamination resulting from the use of old, worn out technology by industries (Nwankwo et al.,1993) leachates from land due to poor land use (Nwankwo 1993) erosion caused by human intervention on the coastline and resulting in increased solids . Besides, there is the challenge of sand extraction from the Lagoon and modification of wetlands through sand filling (Nwankwo, 1996). Furthermore, there is the petroleum industry related contamination (Adesalu and Nwankwo 2005) through sabotage, equipment failure, human error, leakages and inappropriate practices of refined petroleum and spent oil dispensers. These interventions in locations resulted in very high temperatures, low transparency, anoxic condition, very high bio-chemical oxygen demand (BOD_5), very high chemical oxygen demand (COD) and acidic condition (Oyenekan 1975, Ajao, 1996, Nwankwo 2004). Algae, bacteria, benthic fauna and fungi are useful indicators of aquatic environmental quality; they act as early warning signals thereby provoking appropriate remediation.This compilation is an attempt to provide resource materials for environmentalists working in the Nigeria inshore and offshore waters.

2. Table 1. Indicators of environmental status

A. Offshore / oceanic

	Types of environment	Characteristics	Indicator	References
1	Continental slope	Deep water, very cold water	Coccolithophores	Unpublished report
2	Plankton	High alkaline water, salinity above 35%	Predominantly Diatoms, dinoflagellates	Unpublished report
3	Open water Thermocline / stratified waters.	Warm, nutrient poor surface water and deep nutrient rich cold water.	*Trichodesmium thiebetii*	Nwankwo, 1993, 1996, 2004.

B. Inshore / coastal

	Types of environment	Characteristics	Indicator	References
1	Creeks, rivers, lagoons	Acidic, nutrient poor	Desmids, *Eunotia Frustulia*	Adesalu and Nwankwo 2010, Nwankwo, 1996, 2004
2	Fresh water Swamps, creek-lets,	Acidic, nutrient poor, brownish colour	Desmids, dwarfed *Eichhornia crassipes*	Adesalu *et al.* 2008, Nwankwo *et al*; 1999

	creek			
3	Mangrove swamps	Acidic water, brownish to reddish brown exudates possibly humic and fluric acids	*Eunotia*	Nwankwo *et al*; 1999.
4	Coastal waters (creeks, rivers and Lagoons)	Low ammonium compound, low react nitrogen	Heterocystous forms –*Anabaena, Anabaenopsis, Nostoc*	Nwankwo 1996, 2004.
5	Coastal water (creeks, rivers and Lagoons)	High Ammonium compound, high reactive nitrogen	Chrooccocales – *Microcystis*	Nwankwo 1993, 1996, 2007.
6	Shallow waters	Mixing of water shattered	Meroplankton juvenile zooplankton stages,	Unpublished data
7	Deep waters	Vertical environmental gradient	Holoplankton – mostly centric diatoms and araphinidae such as *Tabellaria*, *Synedra*, *Asterionella Fragillaria*	Nwankwo Unpublished
8	Sluggish creeks, river	Bubbles of gas on water surface, pungent smell, transparency very low, high BOD, low Dissolved Oxygen	Anoxic condition *Capitella capetata*, *Nereis*	Ajao and Fagade (1990); Adesalu *et al*., (2008), Adesalu and Nwankwo (2008),
9	Fast flowing creeks, river	High Dissolve Oxygen High tranparency	Rhaophiles	Egborge (1973).
10	Lagoon	Very warm water.	High macro benthic, dead shells, High diversity index	Adesalu and Nwankwo (2005, 2008, 2010); Nwankwo *et al.,* (2008) till present.
11	Surface waters Creeks, rivers, Lagoons	Meso-eutrophic Moderate organic contaminated BOD <8.0 mgL-1, low species diversity, blooms.	*Microcystis aeruginosa*, *M. flos – aquae*. Luxurant growth of *Eichhornia crassipes*	Adesalu and Nwankwo (2005, 2008, 2010); Nwankwo (1993, 1996, 2004); Nwankwo and Akinsoji (1992).
12	Lagoons, creeks	Eutrophic/heavy organic contamination BOD >8.0 mgl-1 very low species richness.	Blooms of algae high biomass	Nwankwo (1993, 1996) Nwankwo and Akinsoji (1992);
13	Open water in Lagoons, tidal creeks	Low moderate brackish condition.	*Bacillaria paradoxa, Hantzschia amphioxyes, Aulacoseira*	Nwankwo (1996, 2004); Adesalu and Nwankwo (2009).
14	Open water in Lagoons, tidal creek	Change of hydroclimate conditions collapse of horizontal environment gradient or build up of horizontal environmental gradient.	Low species riches Low diversity index	Nwankwo (1996).
15	Open water carried by waves	Deep brownish colouration atimes drifting towards the shore line.	Planktonic algae, flagellates	Nwankwo and Onyema (2009).

16	Coastal, drifting from freshwater and mangrove swamp into creeks, river, Lagoons	Deep brown or reddish brown leachates, acidic.	Fluic and humic acid leachated.	Nwankwo *et al.*, (2005); Adesalu and Nwankwo (2005).
17	Riparin vegetation	Clumps of grasses, pure stands of mangroves Brackish water	*Paspalum vulgaris, Rhizophora, Acrosticum, Raphia hookeri, Pachymelina, tympathonus*	Adesalu and Nwankwo (2005, 2008).
18	Lagoons,creeks	Eroding riparine zone, dredging.	Presence of soil algae e.g *Botrydium.*	Adesalu and Nwankwo (2005).
19	Lagoons, creeks	High number of algal species, high biomass, high dominance.	Organic pollution	Adesalu *et al*, (2008); Nwankwo *et al.*, (2008).
20	Lagoons, creeks	Low number of algal species biodiversity, low biomass.	Area of elevated temperatures.	Nwankwo *et al.*, (2009).
21	Lagoon	High brackish water *Tilapia, Asphyxia.*	Bloom of *Chaetoceros* sp.	Unpublished.

3. Conclusion

Proper screening of organism and correct identification are very important in any attempt to interprete biological data for environmental use. Not all species in a genus may have been screened and some species are more function in a presence or absence manner while others are very opportunistic and therefore useful in accumulating contaminants.

It is important to have a proper knowledge of the environment. For instance is it physically controlled or biologically controlled. If physically controlled, what are the forcing functions and if biologically controlled what are the controlling factors?

The tropical environment is determined by rainfall while the temperate environment is determined by temperature. In interpreting results workers should be weary of extrapolation. There are two main seasons in Nigeria and four in the temperate region.

Some species are essential stenohaline, existing either as fresh waters forms or oceanic. Care should be taken not to mess up ones work with a little exhibition of ignorance, atimes the minute details we ignore give us great clues of ecological niches of a myriad of organism.

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References

1. Adesalu, T. A., Nwankwo, D. I. Studies on the phytoplankton of Olero creek and parts of Benin River, Nigeria. The Ekologia. 2005; 3 (2):21-30.
2. Adesalu, T. A., Nwankwo, D. I. Effect of water quality indices on phytoplankton of a sluggish tidal creek in Lagos, Nigeria. *Pakistan* Journal of Biological Science. 2008a; 11(6): 836-844.
3. Adesalu, T. A., Abiola, T.O., Bofia, T.O. Studies on the epiphytic algae associated with two floating aquatic macrophytes in a sluggish non-tidal polluted creek in Lagos, Nigeria. Asian Journal of Scientific Research. 2008b; 1 (4): 363-373.
4. Adesalu, T. A., Nwankwo, D. I. A checklist of Lekki lagoon diatoms. International Journal of Botany. 2009; 5 (2): 126-134.
5. Adesalu, T. A., Nwankwo, D. I. A checklist of desmids of Lekki lagoon Nigeria. International Journal of Biodiversity and Conservation. 2010; 2 (3): 33-36.

6. Ajao, E. A. The influence of domestic and industrial effluent on populations of sessile and benthic organisms in Lagos Lagoon.Ph.D. Thesis, University of Ibadan. 1989; 411pp.
7. Ajao, E. A., Fagade, S. O. The ecology of *Capitella capitata* in Lagos lagoon, Nigeria. Archiv fur Hydrobiologie.1990; 120 (2): 229– 239.
8. Akpata, T. V. I. Effects of sawdust pollution on the germination of fungal spores in Lagos lagoon. Environmental Pollution. 1987; 4**:** 37– 48.
9. Egborge, A. B. M. A preliminary checklist of the phytoplankton of Oshun River, Nigeria. Freshwater Biology. 1973; 4: 569–572.
10. Nwankwo D. I. Phytoplankton of a sewage disposal site in Lagos lagoon, Nigeria. The Journal of Biological Sciences. 1986; 1(2): 89–96.
11. Nwankwo, D. I. Cyanobacteria bloom species in coastal waters of South-Western Nigeria Archiv Hydrobiologie Supplement.1993; 90: 553–542.
12. Nwankwo, D. I., Phytoplankton diversity and succession in Lagos lagoon, Nigeria. Archiv fur Hydrobiologie. 1996; 135 (4): 529–542.
13. Nwankwo, D. I., The influence of sawmill wood wastes on diatom population at Oko-baba, Lagos, Nigeria. Nigerian Journal of Botany. 1998a.; 11: 15–24.
14. Nwankwo, D. I. Seasonal variation in estuarine littoral diatom population in Lagos lagoon, Nigeria. Science Forum: Journal of Pure and Applied Science. 2000; 3 (1): 29-34.
15. Nwankwo, D. I. Studies on the Environmental preferences of blue-green algae (Cyanophyta) in Nigeria coastal waters. Journal of Nigeria Environmental Society, 2004; 2(1): 44-51.
16. Nwankwo, D. I., Akinsoji, A., The benthic algal community of a sawdust deposition site in Lagos lagoon.International Journal of Ecology and Environmental Sciences.1989; 15:197–204.
17. Nwankwo, D. I., Onyema, C. I. An incidence of substratum discolouration in a tropical West Africa Lagoon. Journal of American Science.2009; 5(1): 44- 48.
18. Nwankwo, D. I., Owoseni, T. I., Usilo, D.A., Obiyan, A.C, Uche, A.C., Onyema, I.C. Hydrochemistry and plankton dynamics of Kuramo Lagoon. *Life* Science Journal 2008; 5(3): 83-88.
19. Nwankwo, D. I., Chukwu, L.O., Onyema, I.C., The hydrochemistry and biota of a thermal coolant water stressed tropical Lagoon. Nature and Science 2010; 8(1): 18-32.
20. Oyenekan, J.A. A survey of the Lagos lagoon benthos with particular reference to the Mollusca. M.Sc. dissertation University of Lagos. 1975; 288pp.

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