Biodiversity Issues in Fresh waters of Niger Delta

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Abstract

Increasing anthropogenic activities in the world have immensely contributed to the loss of biodiversity in the aquatic environments. This paper reviewed the various biodiversity issues on aquatic biota in freshwaters of Niger Delta. The threats to global freshwater biodiversity were examined under five components which included overexploitation, water pollution, flow modification, destruction or degradation of habitat and invasion by exotic species. Results indicated decline and loss of biodiversity and linked it to anthropogenic activities, increase in population, habitat destruction etc which cause diverse ranges of damages on aquatic biota. Biodiversity of inland waters is important to the sustained health and prosperity of the society and therefore important for the ecosystem services it provides, in both natural and managed ecosystems, such as the provision of fresh water, flood mitigation, removal of nutrients and other pollutants, trapping of sediments, and the moderation of toxic algal blooms. These services, once lost, are prohibitively expensive to replace by technological means. There is therefore urgent need for steps to be taken in the right direction to reduce anthropogenic activities that could lead to the extinction of flora and fauna in the freshwaters of Niger Delta.

Keywords: *Biodiversity, Freshwaters, Anthropogenic, Issues. Niger Delta*

Introduction

Biodiversity has taken centre stage in the planning and strategy of environmental and conservation bodies throughout the world. Biodiversity is the term used to encapsulate the many facets of the diversity of life. It is referred to the variety of plant, animal and microorganism species, to the different communities its forms, and to the composition of diversity of genes. It also refers to the natural biological processes occurring within ecosystems that support species richness and genetic diversity, in both immediate ecological timeframes and longer-term evolutionary timeframes. The concept of biodiversity emphasizes the interrelatedness of the biological world and the importance of those interrelationships in maintaining diversity. It covers the terrestrial, marine and other aquatic environments such as rivers, streams, wetlands and groundwater systems [1].

The Niger Delta freshwater is blessed with lots of biodiversity according to NDES [2]. This biodiversity of freshwater is under severe threat from diverse anthropogenic activities which include deforestation, inadequate farming practices, invasive alien species, urbanization, oil exploration activities and developmental practices [3]. It has been estimated that about 10 species go extinct every year as part of natural processes and that if the current trend of extinction by unnatural processes continue, that the extinction rate will increase ten thousand times more than the natural rate [4]. This information of course raises conservation concerns owning to the fact that the Niger Delta is regarded as a biodiversity hotspot [5]. Interventions to achieve biodiversity conservation objectives have been most effective where they have taken a comprehensive and systematic approach that integrates social, economic and environmental

aspects [6]. Negotiating a path to effective solutions requires input from a range of government bodies, non-government agencies, community groups and private land-holders whose activities influence the biodiversity of inland waters, whether positively or negatively. Science has an important and arguably central role in biodiversity conservation but its contributions are not always clear, being moderated by a range of socio-economic factors. In this paper, some of the major issues of biodiversity in freshwaters of Niger Delta were assessed.

Aspects/Components of Biodiversity

Biodiversity could be explained under the following components, genetic, species and ecological biodiversity.

Genetic Biodiversity

Genetic biodiversity was looked at from three levels by International Conservation Policy, species, ecosystem and genetic [7].

Species diversity

Biodiversity is frequently assessed in terms of species richness which is simply the number of species in a site or habitat or species diversity which is a similar measure but one giving greater weight to those species that are more abundant.

Ecosystem diversity

Ecological diversity assesses the richness and complexity of a biological community, including the number of niches, trophic levels and ecological processes that capture energy, sustain food webs, and recycle minerals within the systems [8]. The estimates of biological life vary from year to year, region to region and decade to decade. Table 1 shows the known and estimated diversity of life in coastal regions. Ekpo *et al*. [9] revealed that hundreds of thousands of the earth's species have become extinct in the last 50 years because of destruction of their natural habitats and excessive depletion of their populations. The Niger Delta ecosystems of Nigeria, typically consist of mangrove swamps and riparian forests, have come under threat in the last six decades as a result of environmental pollution from oil exploration, drilling, refining and transportation [10] and this is also applicable to fish species.

Table 1: Known and Estimated Diversity of Life in Coastal Regions

	Forms of life	Known species	Estimated total species
1	Insects and other arthropods	874,161,30	30 million insect species, extrapolated from surveys in forest canopy in rainforest region of Nigeria.
2	Higher plants	248,400	Estimates of total plant species range from 10-15% of all plants are believed undiscovered.
3	Invertebrates	116,873	True invertebrate may be number in millions nematodes, eelworms ach may comprise more one million species.
4	Lower plants	73,900	Not available
5	Microorganisms	36,600	Not available
6	Fish		Estimates that 10% of fish remain undiscovered
7	Birds	9,040	Known species probably accounts for 98% of all birds.
8	Reptiles and amphibians	8,962	Known species of reptiles, amphibian and mammals probably comprise over 95% of total diversity.
9	Mammals	4000	

Source: Edwards [11] in Ekpo *et al*. [9]

Major Threats to Freshwater Biodiversity

The threats to global freshwater biodiversity can be grouped under five interacting categories:

1. Overexploitation
2. Water pollution
3. Flow modification
4. Destruction or degradation of habitat
5. Invasion by exotic species [12, 13].

Environmental changes occurring at the global scale, such as nitrogen deposition, warming, and shifts in precipitation and runoff patterns are superimposed upon all of these threat categories [14].

Overexploitation primarily affects vertebrates, mainly fishes, reptiles and some amphibians; whereas the other four threat categories have consequences for all freshwater biodiversity from microbes to megafauna. Pollution problems are pandemic, and although some industrialized countries have made considerable progress in reducing water pollution from domestic and industrial point sources, threats from excessive nutrient enrichment and other chemicals such as endocrine disrupters are growing [15]. Habitat degradation is brought about by an array of interacting factors. It may involve direct effects on the aquatic environment (such as excavation of river sand) or indirect impacts that result from changes within the drainage basin. For example, forest clearance is usually associated with changes in surface runoff and increased river sediment loads that can lead to habitat alterations such as shoreline erosion, smothering of littoral habitats, clogging of river bottoms or floodplain degradation.

Flow modifications are ubiquitous in running waters [16, 17]. They vary in severity and type, but tend to be most aggressive in regions with highly variable flow regimes. This is because humans in these places have the greatest need for flood protection or water storage. The existing dams retain approximately 10 000 km3 of water, the equivalent of five times the volume of the entire world's river [18], Water impoundment by dams in the Northern Hemisphere is now so great that it has caused measurable geodynamic changes in the Earth's rotation and gravitational field [19].

Widespread invasion and deliberate introduction of exotic species add to the physical and chemical impacts of humans on fresh waters, in part because exotics are most likely to successfully invade fresh waters already modified or degraded by humans [20]. There are many examples of large scale and dramatic effects of exotics on indigenous species (e.g. Nile perch, *Lates niloticus*) in Lake Victoria, the crayfish plague in Europe, salmonids in Southern Hemisphere lakes and streams [21], and impacts are projected to increase further [22]. **Table 2 presents the types, sources and routes of entry of pollutants from human activities into the aquatic ecosystem.**

Table 2: Types, Sources and routes of entry of pollutants from human activities into the aquatic ecosystem

Type of pollutant	Source	Route of Entry
Oxygen-demanding waste(organic pollutants)	Domestic sewage, human and animal wastes (such as wastes from canneries and woodpulp mills)	Thrown, dumped or discharge into streams and rivers or into gutters, drains from where they may get washed by run-off into water bodies.
Infectious disease agents	Domestic sewage, human and animal wastes	Washing, swimming or working into paddy rice field and on irrigated land
Plants nutrients such as nitrates, phosphates and others	Fertilized farm lands, ashes and detergents	Run-off from fertilized farmlands
Pesticides such as insecticides, herbicides etc.	Organic and inorganic chemicals	Run-off from pesticides associated with farmlands
Industrial effluents which includes DDT, dyes, cadmium, mercury etc.	Textile factories; distilleries pulp, paper mills, fertilized plants, chemical and allied industry, food, beverages and tobacco industries, soap, detergents and confectionery industries	Human discharge
Eroded sediments	Deforestation and accelebrated soil erosion	Soil erosion, urban storm water run-off and dredging activities
Other solid wastes	Metals, plastics, artificial fiber etc.	Dumping by human beings due to poor management of waste disposal
Petroleum products	Drill cuttings, drilling mud (fluids used to stimulates the production process); accidental discharge of crude petroleum, refinery effluents which include oil and grease, phenol, cyanide, sulphide, suspended solids, chromium and biological oxygen-demanding organic matter.	Petroleum, exploration, exploitation, refining, transportation, storage, marketing, use and ruptured oil pipelines

Source: Blessing [23]

Freshwater Biodiversity in Crisis

The combined and interacting influences of the five major threat categories enumerated above have resulted in population declines and range reduction of freshwater biodiversity worldwide. Qualitative data suggest reductions in numerous wetland and water margin vertebrates (19 mammals, 92 birds, 72 reptiles and 44 fish species), while population trends indicate declines averaging 54% among freshwater vertebrates (mainly waterfowl), with a tendency toward

higher values in tropical latitudes [24]. Furthermore, 32% of the world's amphibian species now are threatened with extinction, a much higher proportion than threatened birds (12%) or mammals (23%), and 168 species may already be extinct [25]. The well-known global decline of amphibians started during the 1950s and 1960s and has continued at the current rate of approximately 2% per year, with more pronounced decreases in tropical streams [26, 27]. This is close to the estimate of 2.4% for declines in populations of freshwater vertebrates over the period 1970–1999 [28]. These estimates are extremely alarming. Extinction rates of freshwater animals in North America, based on combined data sets for unionid mussels, crayfishes, fishes and amphibians, may even be as much as 4% per decade – five times higher than species losses calculated from any terrestrial habitat [29].

Rates of species loss from fresh waters in non-temperate latitudes are not known with any degree of certainty. They are likely to be high because species richness of many freshwater taxa (e.g. fishes, macrophytes, decapod crustaceans) increases toward the tropics. The drainage basins of many large tropical and subtropical rivers (e.g. the Ganges and Yangtze) are densely populated – with large dams, altered flow patterns and gross pollution from a variety of sources being the inevitable outcomes [30]. Table 3 summarizes some impacts of some anthropogenic activities on the biodiversity of some aquatic ecosystems in Nigeria.

Table 3: Impacts of some anthropogenic activities on the biodiversity of some aquatic ecosystems in Nigeria

Aquatic ecosystems	Human activities and possible causes of impacts on biodiversity	Associated impacts on biodiversity	Author(s)
Ikpoba river, Benin city, Edo State	Road and bridge construction and impoundments, resulting in sedimentation and siltation.	Changes in water quality and the longitudinal distribution of species; reduction in the abundance and macro-benthic invertebrates.	Ogbeibu and Victor (1989); Ogbeibu and Oribhabor (2002)
Tropical man-made lake (Moro dam), north of Ilorin township, Kwara State.	Leaching of fertilizers from farmlands obnoxious fishing practices, sewage disposal, washing and bathing with detergents and soda soap	High level of eutrophication resulting from increase in concentration of nitrates in the lake, lower species of plankton and fish death probably occurring from obnoxious fishing practices and poor water quality	Mustapha (2006)
Buguma Creek, Buguma, Rivers State	Pedestrian bridge site, dumping and burning of domestic waste, continuous cutting of mangroves, sand dredging and sand filling, bathing and human settlement	Ecological modification of habitat, drastic reduction in taxa and abundance of species	Oribhabor and Ogbeibu (2009)
Lower Cross River	Human settlement resulting in anthropogenic inputs, probably from upstream and run-off during wet season	Higher level of magnesium, iron, lead, cadmium and nickel than WHO and SON maximum permitted levels for drinking water.	Udoidiong *et al*. (2013)

Source: Blessing [23]

Conclusion

The continuous anthropogenic activities have resulted to a massive decline and or loss of biodiversity in the aquatic ecosystems of the Niger Delta. There is therefore urgent need for steps to be taken in the right direction to maintain the health of the aquatic ecosystems and conserve the wild species from going extinct.

Recommendations

- Anthropogenic activities that lead to deterioration of water quality and ecosystem health should be prohibited.
- Government should intensify the awareness effort on the danger of species extinction.
- Researchers should identify and have a checklist of these species.
- Government should put in place measures towards the protection of endangered species for sustainable development.

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