LOSS OF BIODIVERSITY: THE BURGEONING THREAT TO HUMAN HEALTH

"We are losing biodiversity globally at an alarming rate, and we need a cornucopia of different plants and animals, for the planet's health and our own." [1]

Daine Ackerman
American poet
(1948-)

INTRODUCTION

One of the greatest attributes of the Earth is the biodiversity of her ecosystem. The Convention on Biological Diversity (Article 2) defined biological diversity or biodiversity" *as the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems*".[2] This is a reflection of the more than 9 million types of living thing which include fungi, bacteria, plants, animals, protists that co-inhabit the Earth with human beings and serves as the bases of the diverse array of organismal, genetic and ecological diversity obtainable on Earth.[3] The complex interplay between this rich array of Earth's inhabitants underpins the proper functioning of the Earth's ecosystem. However, the last few decades, have witnessed a rapid disruption and loss of this rich biodiversity in terms of numbers and variability. Human beings are relentless than ever in eliminating genes, species, and biological traits that constitute the biodiversity via her disruptive activities on the Earth ecosystem.

Effects of biodiversity loss

The pressure from agriculture requirement for crop & animal husbandry has made humanity to convert wetlands, forest, and grassland into farmlands and grazing land, among others. Furthermore, the increasing world human population, which has doubled between 1970 and now to more than 7 billion is the other edge of the sword aggravating the global loss of biodiversity. On the other side are factors are exploitation of mineral resources, pollution, the introduction of exotic species & genetically modified organisms, climate changes and alteration and loss habitats which are all connected with human efforts to care for the growing habitats of the Earth.

Every year, at least a species goes into extinction while many species of plants and animals face extinction across the world according to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services Report (2019). [4]

Sadly, most of the global loss of biodiversity occurs in the Developing World, Nigeria inclusive.[5] Furthermore, the critical 25 hotspots of the global loss of biodiversity include areas spanning the rain forest belt of southern Nigeria although the enormous swathe of territory includes the Tropical Andes in South America and Indo-Burma areas in South East Asia. These hotspots are home to a considerable proportion of Earth's species of plants and animals. The Amazon in the Tropical Andes alone harbours 50,000 species or one-sixth of the Earth's total.[6] Generally, known species are going extinct, 1000 times more than newly discovered ones.[7]

The history of medicine and the development of the rich armament of pharmacopoeia to combat diseases are traceable to a great deal to derivatives from flora and fauna whether aquatic or terrestrial in origin that are available across the world from ancient time to the present time. This product includes the ubiquitous aspirin derived from the bark of the willow tree *Salix alba*, which is no more a mere analgesic rather a useful drug in cardiovascular and haematologic disorders treatment.[8] Digoxin, a great drug in managing heart failure is derived from Foxglove *Digitalis purpurea L.* [8] Drugs such as quinine derived from *Cinchona succirubra*, and Artemisin based compounds are made from *Artemisia annua* and have help combat malaria at various times are derived from plant products.[8] While penicillin derived from *Penicillium notatum* may not be prominent antibiotics in the last 20 years, the subsequent and related products such as Erythromycin are derived from a microorganism.[8] Other great products that have saved many lives include antimitotic agents such as Doxorubicin from *Torreya taxifolia and* paclitaxel derived from Pacific Yew *Taxus brevifolia.* The list of products that have been derived from flora and fauna to help combat human disease is endless.

It is interesting to note that only an estimated 10% of the diverse species on Earth have been exploited to combat diseases while a little over 12.5% of the approximately 250 000 species of higher plants have been exploited in the same line.[9] On the other side, only about 1 % of microbial species on Earth are known.[9,10]

No doubt, the loss of biodiversity does not only threaten new drug discovery especially in the light of emerging and reemerging diseases, but it also threatens the ability to discover a more effective therapy for the burgeoning non-communicable diseases, hence man's quest to stem the tide of this increasing global burden.

Equally threatened is the accessibility to clean fresh water and good quality air.[8] The air and water are

greatly more polluted than ever due to human industrial activities, while the purifying capacity of the ecosystem is being lost.[2]

Food production is being affected, thereby endangering the nutritional status of the world population, especially in regions where the poorest habit. The economic activities of natural pollinators, e.g. bees which aids our plants to fruits are estimated at approximately $550billion.[11] The aquatic species are being depleted. Fisheries currently provide 16% of the global protein source. The wild flora and fauna could mean alternative access to the nutritious source to the aforementioned is being wiped out.

While the biodiversity is contracting, there is a great danger of emerging and reemerging of infectious agents which threatens global health. The incidence of Lyme disease or West Nile virus (WNV) in humans have been linked to the loss of biodiversity among the animal host.[12]

While the loss of biological biodiversity appears to affect significantly human health, it has also been opined to be a significant threat to the attainment of sustainable development goals which is the blueprint for achieving a better and more sustainable future for all.[13] Currently it threatens the goal 1; to reduce poverty, Goal 2; zero hunger, Goal 3; good health & well-being and goal 6; clean water and sanitation, Goal 11; sustainable cities and communities, Goal 13; Climate Action, Goal 14; Life Below Water and Goal 15; life on land.[14]

RECOMMENDATIONS

While it may be easier to pass the attempt at the reversal of this loss to the tuft of core conservationists it is necessary to point out that biomedical scientists or researchers and even clinicians who will prescribe the yet undiscovered drugs from flora or fauna have an enormous role to play. In the same vein, the temptation to isolate this discussion to only the conservationist circle, may not be optimal to achieve broad-spectrum coalition for advocacy. Now is the time biomedical scientists join the advocacy to stem the tide of biodiversity loss by joining the luxurious pool necessary for such advocacy.

Conservative efforts should be in the mainstream of discourse in scientific fora of biomedical scientists since this loss threatens the whole capability of modern medicine to keep confronting the burgeoning disease burden.

Furthermore, the least maybe in our local environment we do is to promote and join conservation efforts such as serving as an advocate for the protection of endangered species, increase in protected areas of flora and fauna and exercise high ethics in animal researches involving endangered species.

Indeed, a little there, little here approach may help save the world. A tree or other exotic nurtured in an enforced green space in a rural clinic may be in a right direction and commendable effort at mitigating this ensuing disaster.

There is a need for more interdisciplinary research on the interrelationship of biodiversity loss with medical and medical-related themes. There is also a greater need for inquiries into the usefulness of the numerous natural products in solving human disease miseries. It may be the molecule to cure some of the vast arrays of presently incurable diseases are in some species in the Niger Delta area or Amazon.

Finally, there is a need for the national governments to enact and implement laws to protect the endangered species like the United States Endangered Species Act (1973). It would also be necessary to advocate for domestication locally the Aichi Biodiversity Targets proposed at the Convention on Biological Diversity (CBD) in Nagoya, Japan, in October 2010, which target 1 explicitly state *"By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably"*.[4,15]

CONCLUSION

Although we may not be able to save the extinct species with their lockup potentials, we may at least be able to wrestle the endangered & threatened species from similar extinction. Humanity needs to live a life accommodative of other species to promote healthy and robust dynamism among species, thereby sustaining healthy lives for ourselves and healthy interactions with the ecosystems. The ultimate goal, therefore, will be to halt the rate of biodiversity loss and ensure a stable ecosystem as soon as possible.

REFERENCES

1. BrainyQuote.com [online]. BrainyMedia Inc; 2019 [cited 2019 20 June 2019]. Available from: https://www.brainyquote.com/quotes/diane_ackerman_596383.
2. Organization WH, editor Connecting global priorities: biodiversity and human health2015: World Health Organization and Secretariat of the Convention on Biological ….
3. **Cardinale BJ,** Duffy JE, Gonzalez A, *et al.* Biodiversity loss and its impact on humanity. Nature. 2012;486(7401):59.
4. **Rafferty JP.** Biodiversity loss: Encylopaedia Britannica,Inc; 2019 [updated 14 June 2019; cited

2019 20 June 2019]. Available from: https://www.britannica.com/science/biodiversity-loss#ref342676.
5. **Smith RJ,** Muir RD, Walpole M *et al.* Governance and the loss of biodiversity. Nature. 2003;426(6962):67.
6. **Myers N,** Mittermeier RA, Mittermeier CG, *et al.* Biodiversity hotspots for conservation priorities. Nature. 2000;403(6772):853.
7. **Neergheen-Bhujun V,** Awan AT, Baran Y, *et al.* Biodiversity, drug discovery, and the future of global health: Introducing the biodiversity to biomedicine consortium, a call to action. Journal of global health. 2017;7(2).
8. **Dias DA,** Urban S, Roessner U. A historical overview of natural products in drug discovery. Metabolites. 2012;2(2):303-36.
9. **Cragg GM,** Newman DJ. Biodiversity: A continuing source of novel drug leads. Pure and applied chemistry. 2005;77(1):7-24.
10. **Cragg GM,** Newman DJ. Natural product drug discovery in the next millennium. Pharmaceutical biology. 2001;39(sup1):8-17.
11. Why bees matter [Online]. Food and Agricultural Organization(FAO); [cited 2019 20 June]. Available from: http://www.fao.org/3/I9527EN/i9527en.PDF.
12. **Pongsiri MJ,** Roman J, Ezenwa VO, *et al.* Biodiversity Loss Affects Global Disease Ecology. BioScience. 2009;59(11):945-54.
13. About the Sustainable Development Goals [Online]. United Nations; 2019 [cited 2019 20 June 2019]. Available from: https://www.un.org/sustainabledevelopment/sustainable-development-goals/.
14. Nature's Dangerous Decline 'Unprecedented'; Species Extinction Rates 'Accelerating' [Online]. United Nations; 2019 [cited 2019 20 June 2019]. Available from: https://www.un.org/sustainabledevelopment/blog/2019/05/nature-decline-unprecedented-report/.
15. Aichi Biodiversity Targets: CBD Secretariat; 2019 [cited 2019 20 June 2019]. Available from: https://www.cbd.int/sp/targets/

Oladimeji Adebayo
Editor/Secretary of the Editorial Board