UNIVERSITY OF PORT HARCOURT

ENVIRONMENTAL ADVOCACY AND THE RULE OF SPECIES

An Inaugural Lecture

By

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ENVIRONMENTAL ADVOCACY AND THE RULE OF SPECIES

The Vice-Chancellor, Sir
The Deputy Vice-Chancellors,
Principal Officers of the University,
Provost, College of Health Sciences,
Dean, School of Graduate Studies,
Deans of Faculties,
Directors and Heads of Departments,
Distinguished Professors and Scholars,
Staff and Students of University of Port Harcourt,
Members of the Bar and Bench
My Dear Wife and Children,
Distinguished Guests,
Ladies and Gentlemen.
Gentlemen of the Press
Ladies and Gentlemen

INTRODUCTION

Mr. Vice-Chancellor Sir, let me start this inaugural lecture with quotations from the Holy Book (the Holy Bible) as it is the source of all wisdom and therefore the relevant springboard to launch this expose of environmental odyssey.

> ‘So God created man in his own image, in the image of God created he him; male and female created he them.
>
> And God blessed them, and God said unto them, Be fruitful, and multiply, and replenish the earth, and subdue it: and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth.
>
> And God said, Behold, I have given you every herb bearing seed which is upon the face of all the earth, and every tree, in which is the fruit of a tree yielding seed; to you it shall be for meat’ (Genesis 1:27 - 29, Authorized King James Version).
>
> ‘And the eyes of them both were opened, and they knew that they were naked; and they sewed

> fig leaves together and made themselves aprons' (Genesis 3:7 Authorized King James Version).
>
> '.. thou shalt not destroy the trees thereof by forcing an ax against them: for thou mayest eat of them and thou shalt not cut them down (for the tree of the field is man's life) to employ them in the siege' (Deuteronomy 20:19b, Authorized King James Version).

From the foregoing, Man, (*Homo sapiens*) has divine authority to take care of all living things and meet all his needs from the environment. Basically, it is the performance of plants and their chemical composition that all other organisms of biological origin exploit for their very existence. Our human world for example has been so closely tied to plants that it is difficult to imagine human existence without them. Be that as it may, unless we advocate for their well being and by extension the environment *sensu lato*, our own very existence will come to an end. This is truth, the whole truth and nothing but the truth so help us God.

In all life on earth, plants are the only producers and all consumers are dependent upon plants for food, fibre, wood, energy and oxygen. Knowledge of plants, their habitats, structure, metabolism and inheritance is thus the basic foundation for human survival (Nyananyo, 1986a, b, 1989, 1990, 1992; Isichei, 2005) and by extension all other organisms of biological origin. Plants have determined the course of human civilization – America was discovered during the course of the search for spices (Isichei, 2005) as was the discovery of the Niger Delta as a source of the grains of paradise, *Aframomum melegueta* (alligator pepper). An understanding and documentation of plant species will therefore ensure their conservation and that of the environment.

The late appearance of humans on earth supported by both divine creation and evolutionary theories, laid open to Man a large variety of natural resources to exploit as food, and plants were the natural choice. This was so as majority of plants then and now are the only organisms that had and still have the capability to convert solar energy to chemical energy by the process of photosynthesis. Conversely, the core of several environmental crises (catabolic processes) such as biodiversity loss and global warming involve plants. We have therefore as it were learnt about life from plants and it now appears as if we still have to depend on them to sort out our environmental crisis occasioned principally by the accumulation of excess carbon dioxide (CO_2) in the atmosphere.

In the recent past, the United Nations and other like minded organizations the world over have advocated for the survival and conservation of the species *sensu lato*. Such instruments of advocacy include but not limited to

a. the establishment of the International Board for Plant Genetic Resources.

b. the UNESCO's (United Nations Educational Scientific and Cultural Organization) Man and the Biosphere (MAB) programme.
c. the International Biological Programme.
d. the IUCN (International Union for the Conservation of Nature and Natural Resources).
e. United States endangered species Act.
f. wild Creatures and Wild Plants Act
g. development of International conventions on conservations also known as the Wetlands Convention.
h. the setting up of the Bilogical Records Centre of the Nature Conservancy, UK.

The triple theories of creation to wit: Steady State, Big Bang and Evolution (Pangean theory of evolution) have, however, not yet reconciled the existence and origin of the species as to whether species are

a. organisms on mother earth or not and

b. monophyletic, diphyletic or polyphyletic.

Another set of theories, the Cell theory and the Theory of Biogenesis are to the effect that there is no spontaneous creation. This is captured thus *omnis cellula e cellula* i.e. ‘all living cells arise from pre-existing living cells’.

Be that as it may, one thing is certain, there are organisms presently existing on the surface of mother earth. The nucleic acid definition of life to wit: ‘Life is a complex set of processes resulting from the actuation or fulfillment of instructions encoded in the nucleic acid’ is apt for our discuss.

Environment

The environment is Man’s life support system. It is the structure around which our lives and those of future generations are built. The environment permits all the things required for life, too much or less of which is adverse to our existence.

It is for this reason that all over the world, the subject of the environment is now being addressed more seriously than before (Nyananyo, 1999). Our immediate environment is, however, shrouded in mystery that our so called technological advancement/perfection has not been able to unravel. For instance, drought catches us flat footed, sometimes even when there are predictions of bumper harvest. We are able to use satellite to detect gathering cyclones, typhoons and tsunamis, but we are yet to predict when these will start and of course cannot prevent them from taking their full course (Nyananyo, 2005).

In fact, the United States of America, the richest and most technologically advanced country in the world today, tried hard to even evacuate its citizens from New Orleans in 2005 when a category five (5) Hurricane christened 'KATRINA' wreaked havoc on this coastal town. In May 2008, Myanmar (called

Burma until 1989), one of the poorest countries in the world lost about 100,000 of its citizens with about one million rendered homeless in one day in its delta region, the IRRIWADY DELTA, as a result of a cyclone. Hurricanes, cyclones, tornados and related events develop as a result of global warming. I will get back to this later-on.

Environment is defined at section 38 of the Federal Environment Protection Act, Cap F. 10, Laws of the Federation of Nigeria (LFN) 2004 to wit:

> includes water, air, land and all plants and human beings or animals living therein and the inter-relationships which exist among these or any of them

In order to address the issue of environment holistically, the United Nations (UN) concept of sustainable development is apt. This was brought to the fore by the Grace Brundtland Commission Report (1987) which defined sustainable development as:

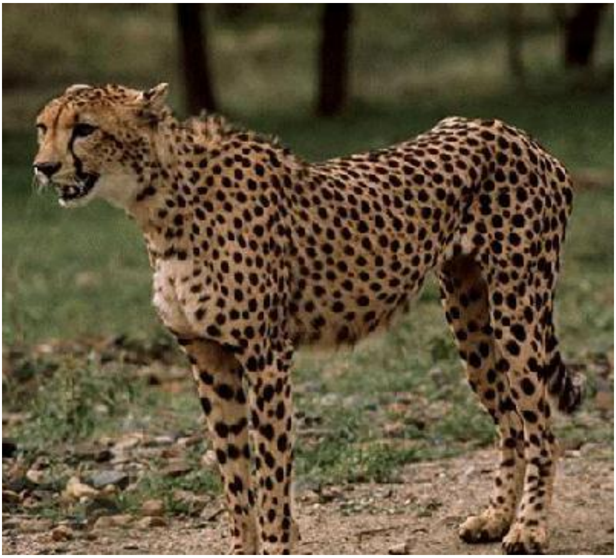
> development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs

Plate 1: Representatives of components of our environment.

Gorilla gorilla (Gorilla)

Panthera pardus (Leopard)

Canis familiaris (all dogs belong to this species; Domestic dog)



Acinonyx jubatus (Cheetah or hunting leopard)

Butterfly (Order Lepidoptera)

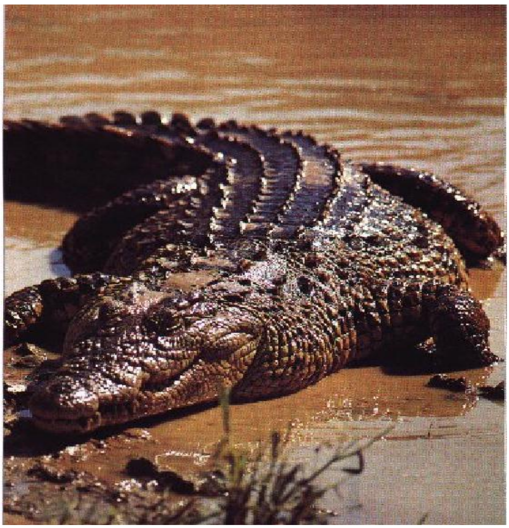
Aonyx capensis (African, cape clawless or giant African otter)

Loxodonta africana (The African elephant)

Chelonia sp.(Green sea turtle)

Eichhornia crassipes (Water hyacinth)

Laguncularia racemosa (White mangrove) on the left and *Rhizophora racemosa* (Red mangrove) on the right and foreground



Crocodylus noliticus (Nile crocodile)

Periophthalmus sp. (Mud skipper)

Pistia stratiotes (water lettuce)

Psittacus erithicus (African grey parrot)

Rhizophora racemosa (Red mangrove)

Panthera leo (Lion)

What is Global warming?

Global warming is the term denoting the accelerated warming of the earth's surface due to release of greenhouse gases (GHG) from industrial activity and deforestation. The impact of changes of atmospheric temperature and other related climatic indicators has raised the issue of what to do about the consequences of such changes on human existence and its environment. This brought about the UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC), an international treaty on global warming which was adopted at the Earth summit in Rio de Janeiro in 1992 (Sarowinyo, 2005). An amendment was later made to the UNFCCC to reaffirm some sections and commit countries to reduce their emissions of GHG to wit: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), or engage in emissions trading if they maintain or increase emissions of these gases. The amendment was adopted in Kyoto, Japan in 1999 (Nyananyo, 2005), hence the 'Kyoto Protocol'. This amendment opened for signature on December 11, 1997 at Kyoto, Japan and entered into force on February 16, 2005. The Kyoto Protocol is a legally binding agreement under which industrialized countries are expected to reduce their collective emissions of greenhouse gases by 5.2 % (compared to year 1990) by the year 2012 (Sarowinyo, 2005). Although, non industrialized countries do not yet contribute appreciably to the greenhouse gas emissions, they have also signed the Kyoto Protocol. For instance, Nigeria ratified the said agreement on Thursday, February 24, 2005 and as a consequence, the Kyoto Protocol is now effective in Nigeria.

Nigeria is therefore subject to any sanction(s) that are associated with it. As a result of the environmental advocacy, the UNFCCC met in Bali, Indonesia on Sunday, December 3, 2007 to prepare another Protocol to replace the Kyoto Protocol come 2012.

Global warming is a consequence of pollution. Pollution in its simplest form can be defined as an undesirable change in the physical, chemical or biological characteristics of the air, water or land that can harmfully affect health, survival or activities of humans or other living organisms and is irreversible. The *status quo ante* of a polluted environment cannot be restored unlike that of a contaminated one (Nyananyo, 2008a, b). The pollution of various resources has gone to such an extent that we are unable to breathe fresh air, and drink fresh water.

On the one hand, the advancements of science and technology have added to human comforts by giving us automobiles, electrical appliances, supersonic jets, space crafts, better medicines, better chemicals to control harmful insects and other pests etc., but on the other hand, they have given us a very serious problem to face. This problem is pollution. Pollution does not have to cause physical harm, but it may merely interfere with human activities (Prabhakar, 2001). It is also not restricted by or to political associations, ethnic groupings, race or geographical boundaries.

Ozone layer depletion.

This is at the centre of the environmental crises that could lead to total loss or extinction of biodiversity including Man. Ozone, is a tri-molecule of oxygen which is found in the troposphere as a pollutant, but present in the stratosphere (some 15 – 50 km above the earth's surface) as a shield.

Ozone is considered one of the criteria pollutant on the surface of the earth and also as a secondary pollutant. It is a blue pungent smelling gas, which exists like a thin shield in the stratosphere screening out the sun's harmful ultra-violet radiation (with short wavelength) from reaching the earth's surface. Short wavelength radiation from the sun is very harmful to life on the earth's surface as it damages the genetic material, De-oxy ribonucleic Acid (DNA), causing skin cancer, cataracts, suppressing the efficiency of the immune system, enhancing tumor formation, growth and spread, clouding of the eye, which impairs vision and exacerbates eye disorders, crop failures and /or reduction in quality of yield, thawing of the ice caps, etc. (UNEP, 1989, Nyananyo, 1999, 2002). The attendant flooding of coastal land masses and deltaic formations together with the biodiversity therein will as a consequence be the first victims. In fact, this manifested in the Ganges Delta in the Indian sub continent in Bangladesh in November 2007. These negative effects underscore the importance of maintaining the Ozone layer. If therefore, these emissions which deplete the ozone layer are curtailed or eliminated, the protective ozone layer would be maintained, thereby averting the numerous consequences of the threat to mankind (Ubong, 2005), biodiversity and the environment *sensu lato*.

It is worthy of note that ALL OZONE DEPLETING SUBSTANCES ARE MAN-MADE CHEMICALS AND GASES (capitals mine) which when released into the atmosphere, drift to the stratosphere to react with and tear apart the ozone shield which protects the earth from harmful radiation from the sun. These ozone depleting substances are chlorofluorocarbons (CFCs) which are stable on earth. They are not reactive in the troposphere and do not pose any threat to land, sea or the plants and animals; it is this property that makes them very useful to both industry and consumers on the earth. But as they drift to the stratosphere, intense Ultraviolet (UV) radiation severes their chemical bond, releasing chlorine which strips an atom from the ozone molecule turning it into an ordinary oxygen. The chlorine molecule acts as a catalyst accomplishing its detraction without itself undergoing any permanent change, so it can go on repeating the process. In this way, CFC molecules can destroy thousands of molecules of ozone (UNEP, 1989). Chlorofluorocarbons are a group of anthropogenic chemicals called freons. These CFCs were invented only in 1982 more or less by accident and were first used as working fluid for refrigerators, but today their use has widened to include a wide range of services (Table 1). The most common and widespread of CFCs are CFC 11 and 12. These coincidentally are the most damaging.

Table 1: Range of use of CFC substances

S/No	Nature of Use	Usefulness	Percentage (%)
1	Refrigerators, Freezers, Air Conditioners.	As coolant	30
2	Aerosols	In automobiles, cups, cartons, and related items.	25
3	Solvents	Used in cleaning of computer parts, delicate circuitry, and other related items.	20
4	Gases	Propellants in aerosol cans for Perfumes, insecticides and related items.	25

What is a species?

The word species is not an English word but latin. It is both singular and plural. There is therefore one species, two species, one million species NOT ONE SPECIE, TWO SPECIES (capitals mine). In fact, when the terminal letter ‘s’ is detached from species, the resulting word SPECIE (capitals mine) means coin in the English language. Also, speciesism has a totally different meaning. This is the discrimination against, and exploitation of, animals by humans in the belief that humans are superior to all other species of animals.

Biologically, species are fundamental entities (Nyananyo, 1986a, b, 2000, 2006, 2007; Nyananyo and Heywood, 1987). It is in this biological context that we will be looking at species. They are the basic units of taxonomy and classification (Davis and Heywood 1973; Greuter *et al*., 1999). In addition, they represent the basic unit of phylogenetic studies

(Rieseberg and Bouillet, 1994). Conservation biologists focus their efforts on species as they are often considered to form the basis of biodiversity (Falk and Holsinger, 1991). Evolutionists on the other hand regard species as critical evolutionary units, the genesis of new species constituting the only way to lead to the diversification of lineages, while intra-specific processes foster adaptation and maintenance (Mayr, 1969).

There are, however, various concepts attributable to understanding and recognizing the species. These concepts are:

Biological

Morphology-based taxonomic

Phenetic

Phylogenetic

Phylogenitc apomorphic

Phylogenetic diagnosability

a. Biological species concept.

The biological species concept is the most well-known and widely employed approach to species and speciation. It maintains that a species is '*a group of interbreeding (or potentially interbreeding) populations that are reproductively isolated from other such groups.*' The biological species concept has been the prevailing view of species in animals (Coyne, 1992; Coyne and Orr, 2004) and has also played a major role in views of plant species as well (Nyananyo and Olowokudejo, 1986; Nyananyo, 2007). However, it has long been maintained that the application of the biological species concept is difficult in plants due to frequent hybridization. However, some hybridization between species and gene flow do not necessarily imply that two entities must be considered a single species (Coyne and Orr, 2004). In part because of frequent hybridization between plant species, many systematists have largely abandoned the biological species concept (Ehrlich and

Raven, 1969; Donoghue, 1985; McDade, 1995; Judd *et al*., 2002).

However, the biological species concept continues to have strong advocates in plant evolutionary biology (Olowokudejo and Nyananyo, 1986; Schemske, 2000) and recent analyses suggest that plant species may be more likely than animal species to represent reproductively isolated lineages (Davis and Heywood, 1973; Rieseberg *et al*., 2006; Soltis *et al*., 2007).

b. Morphology-based taxonomic species concept.

This has been widely used. It regards species as '*an assemblage of morphologically similar individuals that differs from other such assemblages.*' This concept though practical for taxonomic purposes is subjective. Simply put, the amount of difference that is worthy of species rank cannot be prescribed objectively (Grant, 1981). Different taxonomists may have different criteria. Many systematists may only consider obvious morphological differences and not cryptic (i.e. hidden) characters that separate population systems.

c. Phenetic species concept.

This though is also based on morphological variation is less subjective than the Morphology-based taxonomic species concept (Sokal and Crovello, 1970). The phenetic species concept rests on the assumption that members of one species share an overall similarity and are separated from other species by a gap in variation (Judd, 1981).

d. Phylogenetic species concept.

The prevalence of phylogenetic thinking prompted the development of several phylogenetic species concept. These have all, however, been collapsed into two:

Phylogenetic apomorphic species concept.

This is so called because apomorphies (either molecular or morphological) are employed in species diagnosis. Species are recognized on the basis of monophyly and are defined as '*the least inclusive taxon recognized in a formal phylogeneitic classification*' (Donoghue, 1985; Mishler, 1985; Mishler and Theriot, 2000). It should be noted that variants on these phylogenetic concepts have been proposed (De Queiroz and Donoghue, 1988; Baum and Donoghue, 1995; Davis, 1997).

Phylogenetic diagnosability species concept

Cracraft (1983) defined a species according to the phylogenetic species concept as '*the smallest diagnosable cluster of individual organisms within which there is a parental pattern of ancestry and descent*.' Likewise, Davis (1997) considered species as '*the minimal elements of hierarchic descent systems*.' Operationally, however, species are defined as ‘the smallest aggregation of (sexual) populations or (asexual) lineages diagnosable by a unique combination of character states’ (Nyananyo, 1986a ,b, 1989, 1990, 2007; Nixon and Wheeler, 1990; Davis and Nixon, 1992; Wheeler and Platnick, 2000). That is, species are defined as separate lineages, which must be diagnosable (on the basis of morphological or non-morphological characters; the diagnosability species concept (Judd *et al*., 2002), the states of which must be invariant within each recognized species (Soltis *et al*., 2007).

Recognition of autopolyploidy as species.

One of the biggest apparent challenges to the argument that autopolyploids are distinct species is that each polyploidy may, in fact, be of ‘multiple origin.’ Recent genetic studies have shown that many polyploids (allopolyploids and autopolyploids) have formed repeatedly (Soltis and Soltis, 1993, 1999; Soltis and Soltis, 2000). Following the evolutionary and phylogenetic species concepts, some might prefer that each new lineage be recognized as a species (Soltis and Soltis, 1999), which may best reflect evolutionary history but seems highly impractical on many grounds. Alternatively, these independent polyploidy lineages may be interfertile, and thus interbreed when they come into contact, and could be regarded as one biological species. Furthermore, gene flow among these lineages may fairly rapidly homogenize any differences due to independent ancestry and result in a single polyploidy entity that could be recognized as a species under a number of species concept.

The argument is that many species compose multiple cytotypes that represent autopolyploids, or presumed autopolyploids, of the basic diploid cytotype. However, rarely has an autopolyploid been formally named and considered to represent a species distinct from its diploid progenitor. One of such rare examples is *Zea perennis* (a tetraploid, 2n = 40). Iltis *et al*. (1970) discovered and described a diploid (2n = 20) species, *Zea diploperennis* that is morphologically similar to *Z. perennis*. *Zea perennis* is now generally thought to be an autotetraploid derivative of a *Zea diploperennis*-like ancestor (Tiffin and Gaut, 2001). The view of diploids and autopolyploids as representing 'races' within a single species persists. For example, Thompson and Lumaret (1992) stated 'but in the case of autopolyploids, polyploidy may simply represent a micro-evolutionary process generating and maintaining genetically based variation within individual species, and that reproductive isolation as a result of autopolyploidy may be insufficient for the maintenance of a completely independent unit. In such cases, polyploidy is not a mechanism of speciation.'

The major reasons why autopolyploids have not been named as distinct species are:

Tradition of including multiple cytotypes in a single named species and Tradition and convenience of adhering to a broad morphology-based taxonomic (or phenetic) species concept.

As a result, plant biologists, have underrepresented the distinct biological entities that actually exist in nature (Nyananyo, 1989, 1990, 1992, 2006; Soltis *et al*., 2007). Although, it may seem ‘practical’ to include morphologically highly similar cytotypes in one species, this practice obscures insights into evolution and speciation and hinders conservation. However, we do not suggest that all cytotypes should be named; each case must be carefully considered. This way many ‘unnamed’ autopolyploids that meet the requirements of multiple species concept, including the biological, taxonomic, diagnosability, apomorphic, and evolutionary species concept. In addition, if they meet the requirements of distinct geographic ranges relative to the diploid parent and can be distinguished morphologically, and largely reproductively isolated (through a diversity of mechanisms including reproductive and ecological isolation) then such autopolyloids should be recognized as distinct species (Soltis *et al*., 2007).

The traditional species concept is commonly accepted as tripartite (Zander, 2007): a biological species concept that is appropriate for well-studied species, like birds, with a distinct gene pool or potentially interbreeding populations and generally clearly marked morphological differences associated with habitat, but is problematic in cryptic species; an ecological species concept (van Valen, 1976; Andersson 1990, 1992) that is appropriate for organisms that may or may not have interbreeding populations but, when taken as a unit, have essentially identical morphotypes, reproductive strategies, and environmental preferences and interactions ; and an 'alpha taxonomic' concept appropriate for species that

are expected by experts to eventually fit a biological or ecological species concept when better studied.
All three concepts provide basic taxonomic units that react alike in experimental studies or in nature and are of practical use in science (Raven, 1974).

It is however, worthy of note that the ecological species concept as basic taxonomic unit is not the same as the basic evolutionary unit, which is usually considered to be one population as affected by the fitness of its individuals due to selection (selectionistic interpretation of evolution: e.g. Gillespie, 1991; Pianka, 2000) or rapid decline in population size (bottlenecking) followed by genetic drift that changes relative numbers of mutations in the population (neutralistic interpretation of evolution e.g. Nei, 2005). The second interpretation is supported by the recent discovery of massive though gradual changes in apparently neutral DNA bases over time, suggesting that selection may be less important than neutral exon changes in affecting the phenotype (Zander, 2007). If hybridization occurs, but the two entities do not emerge, they still represent distinct species (Grant, 1981; Soltis *et al*., 2007).

Conclusively, monophyly is convenient for developing a simple, artificial classification from dichotomous trees of a medley of morphological traits parsimoniously distributed in cladograms, or of molecular traits accumulated along lines of inferred individual pedigree or population relationships. In the context of molecular phylogenetic analysis, however, it enforces the biological species concept. Any but the most geographically restricted species and higher taxa can produce new phenotypes with new environmental strategies from any where out of a commonly complex internal phylogentic structure, and evolutionary classification should reflect this natural paraphyly.

The present crisis in biodiversity and by extension the environment clearly involves strong selective pressures. This calls for a return to process-oriented *diagnostic systematics* organized in part by the phylogenetic clustering properties of molecular genealogies of inferred populations and individuals. The theoretical details of evolution of the phenome through selection or even random fixation of traits among extant taxa in the dynamic context of the ecological species concept, is of greatest potential value in studying and preserving biodiversity (Zander, 2007).

A close study of the living organisms in a given habitat at a particular time, will show that these living organisms occur as a series of like individuals with certain common features. A given series of such recognizably similar individuals, obviously distinct from other such series, are in general what taxonomists call *Species* .When a comparison of species with one another is carried out it is found convenient to group those that share most features in common into larger more inclusive groups or *taxa* (singular *taxon*) which are called *Genera* (plural; *Genus*, singular). When genera are compared with one another, it is found convenient to group together those with features in common into yet more inclusive groups or *taxa* called *Tribes* When a number of species come together to form communities, each fits in a different niche and plays a different role in the internal dynamics of the community. Communities may be distinguished as minor or major. Minor communities often called societies are secondary aggregations within a major community and are as a consequence not completely independent units as far as circulation of energy is concerned. Major communities, on the other hand, are those which, together with their habitats, form more or less complete and self sustaining units or ecosystems except for the indispensable input of solar energy.

The biotic community along with its habitat is called an ecosystem. The term ecosystem has hitherto been loosely applied to units of various sizes and characteristics. It is, however, best limited to distinctive combinations of air, soil and water conditions with vegetative, animal and microbial life that possess functional unity.

Dominance is the relative control exerted by organisms over the species composition of the community. Species exerting this important control are called dominants. Whereas, plants are more frequently dominant in terrestrial communities than are animals; in aquatic communities, animals are. Again, although dominance is often not developed, it is most commonly expressed in the reaction of an organism on its habitat.

Sometimes, dominance is demonstrated in coactions (direct effects of organisms on each other). Although animals are more common co-actors than plants, plant pathogens may occasionally exert dominance in this way. As a notable example, the black sigatoka (a fungus), virtually eliminated the plantain and banana (*Musa* sp.) populations in the cartographic Niger Delta a few years ago. In some fresh water ponds, carp and suckers, may consume much of the submerged vegetation. This co-action thus prevents the plant constituents from assuming their usual role in the community and by so much prevents the occurrence of animal species that depend directly upon the plants. These fish species also react upon the habitat by stirring up the bottom from which they derive organic matter, thereby greatly increasing the turbidity of the water. Penetration of light into the water is reduced, greatly handicapping sunfish, bass, and other species which locate food visually.

Number, types and health of organisms on earth

The 2007 Annual Checklist of all organisms has a total of 1,008,965 (One million, eight thousand, nine hundred and sixty five) species. It is worthy of note that most of the figures for numbers of species of seed plants over large geographical areas for instance have been based on subjective estimates rather than objective data analysis. Reliable figures exist only for relatively small regions. Adding these figures together does not, however, give a regional or global estimate because of the large degree of overlap (Govaerts, 2001). The same is true of all other organisms.

Just as signs of disease can be detected in a patient's urine, ecological maladies now show up in the waters that drain the land. A stream in an undisturbed forest runs clear but rivers like the Nun, Forcados, Orashi, Sombreiro, St. Nicholas, Rio Bento (Brass), Ramos, Dodo that drain the Niger Delta are laden with silt when they reach the Atlantic Sea, evidence of deforestation and soil erosion upstream.

DIVERSITY OF ORGANISMS.

As a consequence of Man's understanding, organisms have now been divided into three major groups to wit: Plantae, Animalia and Archaea groups. Darwin (Charles Darwin) (1859) published his theory in *On the Origin of Species by means of natural selection*. The idea that species change, though heretical in mid-Victorian England, was by no means new. Charles's own grandfather, Darwin (Erasmus Darwin) (1803) had propounded it in verse in his poem, *The Temple of Nature*. Lamarck (1792) in revolutionary France, was an evolutionist, but English naturalists including Darwin (1859) rejected his ideas on adaptation as absurd. What made Charles Darwin's theory different, and what gave it enduring value was the simple way by which species became exquisitely adapted to various ends. Natural selection, the mechanism of evolution, is the quintessence of Darwinism and explains how adaptation was thought to have arisen without God. Natural selection is driven by pressure of population increase that produces a struggle for existence. Whereas, Erasmus (1803), Charles's own grandfather, regarded natural selection as a war among plants, Charles (1859), the grandson of the evolutionary poet defined the struggle for existence in a broader sense, with an emphasis on the victors as being those that leave the most offspring. Progeny are the prize of evolutionary success and multiply the rewards of natural selection with each passing generation. A successful variant can therefore spread with amazing rapidity. There is a paradox contained in the Darwinian argument, and it is this. Natural selection favours those individuals that have the most offspring. The descendants of these individuals inherit the advantages of their parents and continue to multiply, while the progeny of others become fewer and fewer until they are gone. This sounds like a mechanism designed to favour only a creature with superlative powers of reproduction: a Darwinian demon.

There is a potential Darwinian demon hiding in every species because all populations are capable of increasing geometrically if unchecked. Throughout the fourteen chapters of *The Origin of Species by natural selection*, there is but one illustration. It is a tree: an evolutionary tree. No other metaphor so compactly and completely sums up what evolution is all about. Tracing branches downward from branch tips to root emphasizes the common ancestry of all life. If Darwin were writing today, a tree would definitely be his logo. The dead and broken branches that encrust the Earth are species known as fossils, such as the seed ferns and giant lycopods that grew in the carboniferous period in swamps and later became coal, or the dead remains of tiny creatures whose shells accumulated over millions of years in marine sediments and are today lime stones such as chalk. In fact, there is new evidence that water lilies, *Nymphaea* spp. were present in the early Cretaceous. A tiny three millimeter long water lily flower was discovered in the deposits from the early cretaceous period in Portugal and estimated to be at least 115 – 25 million years old placing them among the oldest fossil angiosperms (Friis *et al*., 2001).

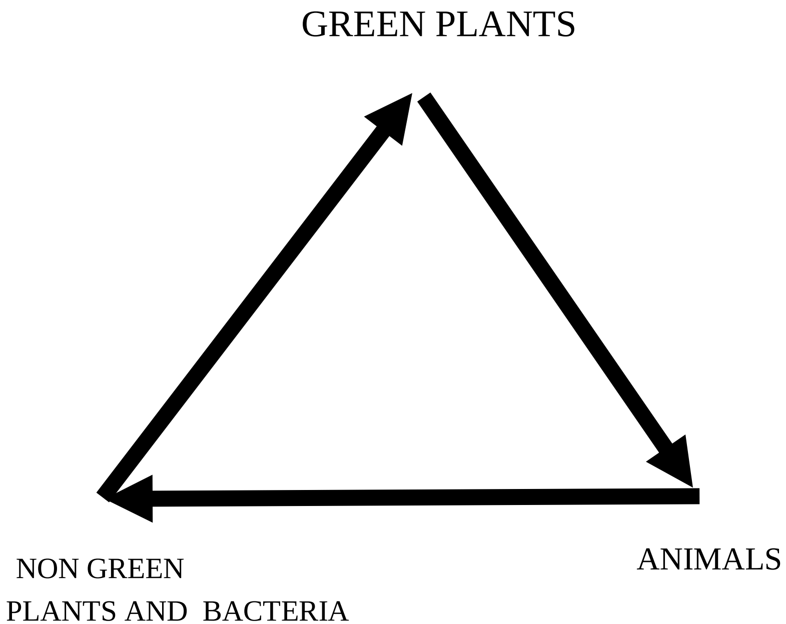
It is estimated that 95% of all species that have ever lived are now extinct (Silvertown, 2005). Darwin’s insight continues to astound and illuminate, a century and half after his death. The frightening truth is clear: Darwin may be dead, but his demons are alive. But how then, in a world threatened by demons, does diversity evolve?

CONCLUSION

There is a paradox at the heart of the theory of evolution. Natural selection favours above all, the particular individual that leaves the most offspring, a super organism that might be called the Darwinian Demon. If it existed, this theoretical ogre would populate the world with only its kind and would extinguish all biodiversity as we know it. This, of course, will eventually lead to its own extinction. So why then if evolution favours this demon, is the world filled with so many different life forms? What keeps this Darwinian demon in check? If humankind is now the greatest threat to biodiversity on planet earth, have WE become the Darwinian demon?

The harmony that Linnaeus found in nature was the recognition that plants are usually adapted to the regions in which they grow, that insects play a role in flower pollination, and that certain birds prey on insects and are in turn eaten by birds which are in turn eaten by other animals including man. This realization implies, in contemporary terms, the flow of matter and energy in a definable direction through any natural assemblage of plants, animals and microorganisms. Such an assemblage, termed an ecosystem starts with the plants, and ends with plants.

The tripartite arrangement of nature.



PRODUCERS

(Plants with the green pigment called chlorophyll.)

↓

Consumers
(Animals)

↓

Decomposers

(Plants without the green pigment, fungi and bacteria.)

Any interruption to this tripartite arrangement will lead to instability in the environment and biodiversity. Unfortunately, this is the case now as the ozone layer depletion caused by the numerous environmentally unfriendly activities of *Homo sapiens* has already started distorting the harmonious relationships of the members of this tripartite arrangement.

Conservation and sustainable use of biological diversity are as a consequence of critical importance in meeting the health, food and other basic needs of the growing population of the species of the world, for which purpose access to and sharing of genetic resources and technologies are essential.

The conservation and sustainable use of biological diversity by species led by Man (*Homo sapiens*) will contribute to peace for mankind and maintain biodiversity. THIS IS THE RULE OF SPECIES. May God Almighty help us achieve this in Jesus name. Amen.

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