INFLUENCE AND MANAGEMENT OF HERBIVORES IN FORESTS

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1. Introduction to the Problems: the Tropical Forests

The wet tropical forest is, on the whole, a unique ecosystem in the world that is known to house the absolute highest number of species of both plants and animals. In this regard, it is enough to stress that the total number of flowering plant species currently known around the world is ~250 000, of which ~90 000 are of the rain forests of South America and Central America, and ~30 000 are of the rain forests of tropical Africa.

Of course, the extreme biodiversity richness of forest ecosystems in the tropics is an immense genetic and economic value for humankind, which seems essential for the future in any aspect we may consider it. However, in vast areas of the world, the fantastic richness of the flora and fauna of forest ecosystems is under serious threat, and, although housing about half of all the plant species currently known around the world, forests remain on the top of the list of the most fragile environments of the world. Indeed, it is well demonstrated that, once subjected to cutting, the forest is no longer able to rebuild itself in the same way as it appeared before cutting. Until a few decades ago, forests covered approximately 11 600 000 km^2, but they are actively cut, burned, chemically defoliated, and devastated at an approximate rate of 114 000 km^2 y^{-1}, which corresponds to worldwide yearly forest decimation of an area comparable to all of Greece. Because of this, it is estimated that, without any drastic operation of international relevance to avoid its further destruction, the global forest resource of the tropical regions could vanish during 2020–2050. And, of course, the situation is even more dramatic in some particular regions. For instance, in Ivory Coast (West Africa), every year ~5000 km^2 of forest are destroyed for development installations, industries, etc., thus it is presumed that its whole forest resource will disappear by the second decade of this millennium. And it is not difficult to predict terrible consequences for the economy of the entire country, which is currently among the richest of the continent, but

relies heavily on forest products: ~12.5% of all of Ivory Coast's exports are linked to forest resource utilization. Brazil, with the largest forested surface in the world, is currently exploiting and destroying close to 14 600 km^2 y^{-1}—a rate that is no longer sustainable.

The international scientific community has long expressed its concerns about the risks of losing the immense environmental richness of forest habitats, particularly in tropical regions that house the majority of the economically handicapped countries of the globe. Indeed, scientists are in general agreement that the destruction of the forest ecosystem would be one of the most tremendous catastrophes of the present era, with devastating effects not only on local climates, but also on the global climate. In fact, it is well known that the enormous transpiring mass of vegetation allows easy and rapid recirculation of great amounts of water through rainfall (evapotranspiration). But without the dense arboreal coverage due to forests, most of the water would run to the seas without evaporation, thus causing massive erosion to soil, and a general progressive aridity of the climate. In addition, there is no doubt that the progressive desertification with consequent famines and the very low quality of cultivations of a great portion of the African continent are mainly consequences of the catastrophic cutting of large portions of tropical forests. In this regard, there are many reasons to accept the idea that forest alteration by primitive humans in Africa ~100 000 years ago was much stronger than what was thought up until now, and it probably caused the extinction of forested and bushed territories even in areas that are nowadays occupied by the Sahara Desert. Indeed, the rupicolous pictures represent leopards, hippopotamus, elephants, and ostriches in regions that are currently entirely desertic; these pictures display the ancient distribution of the forests and of a climate that was much wetter than in present days.

It is also noteworthy that the Dahomey Gap (i.e., the savannah-like vegetation strip that currently separates the rain forest blocks of Guinea–Ghana from that of Nigeria–Cameroon) is not a natural gap in a otherwise enormous rain forest extension, but a human-derived habitat alteration that has had enormous effects on the genetic divergence of many floral and faunal species.

2. The Deciduous Forests of the Temperate Regions

Very few natural environments have stimulated the imagination of poets and writers as have the deep and mysterious woods that still cover a considerable fraction of the western developed world. To a large extent, these woods are the seasonal deciduous forests that have developed in the so-called "temperate regions" (i.e., areas where a relatively mild spring–summer is contrasted by a relatively mild autumn–winter, and where rainfall also has a seasonal incidence).

However, when we use the term "temperate," we should always consider that it is simply a general and rather imprecise definition. For instance, the macroclimate of central Europe, Manchuria, and eastern part of North America is "temperate" only regarding annual mean values for both rainfall and air temperatures; but, in reality, the winters are almost as cold as in the arctic plains, and the summers are almost as hot as in the tropical regions. And the same extraordinary seasonality is seen also in the rainfall

regime. Thus, it is not surprising that both plants and animals have evolved adaptations to survive to these seasonal oscillations in the climatic conditions.

For instance, the main characteristic of the trees is their ability to seasonally loss their leaves, whereas the same option has not been evolved in trees from other more stable bioclimates. This property of temperate forest trees is an adaptive response to the "physiological drought" of the incoming winter months, when water is in the form of ice and thus not usable by plants; tree limbs defend the physiological status of the whole plant in a manner comparable to the spiny structure of bushes in desert and sub-desert ecosystems. On the other hand, the high humidity generated from abundant spring rainfall has constrained trees to evolve leaves with a broad transpiration surface, similar to that exhibited by trees of the tropical rain forests. And, as further consequences of the seasonal climatic variations, birds have evolved migrations to meet with these changes, and other adaptations include the winter latency of reptiles, amphibians, insects, etc.

Currently, the deciduous forests cover a great extent of Europe (from England to Galicia, and from southern Russia to southern Sweden), the eastern region of United States of America (from the region of the Great Lakes to the Gulf of Mexico), a great part of Manchuria in eastern Asia, Korea, and Japan.

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Biographical Sketch

Godfrey C. Akani has been a senior lecturer and then professor in Environmental Biology (Ecology) at the Rivers State University of Science and Technology, Port Harcourt, Nigeria. He obtained his first degree in Zoology, at University of Ibadan, Nigeria, and later proceeded to the Rivers State University of Science & Technology where he obtained masters and doctorate degrees. He was appointed Curator, Biological Sciences Museum (RSUST) since 1992, in addition to his academic roles. Over the years his research interest has been on the forest and wildlife ecology of the Niger Delta. He has a considerable wealth of field experience having been involved in a series of environmental impact assessment (EIA) studies of major development projects in Nigeria. Akani has many published papers on the ecology of this basin and is a fellow of the Institute of Vertebrate Zoology, a member of the Nigerian Environment Society (MNES), and a member of the Nigerian Conservation Foundation (MNCF).