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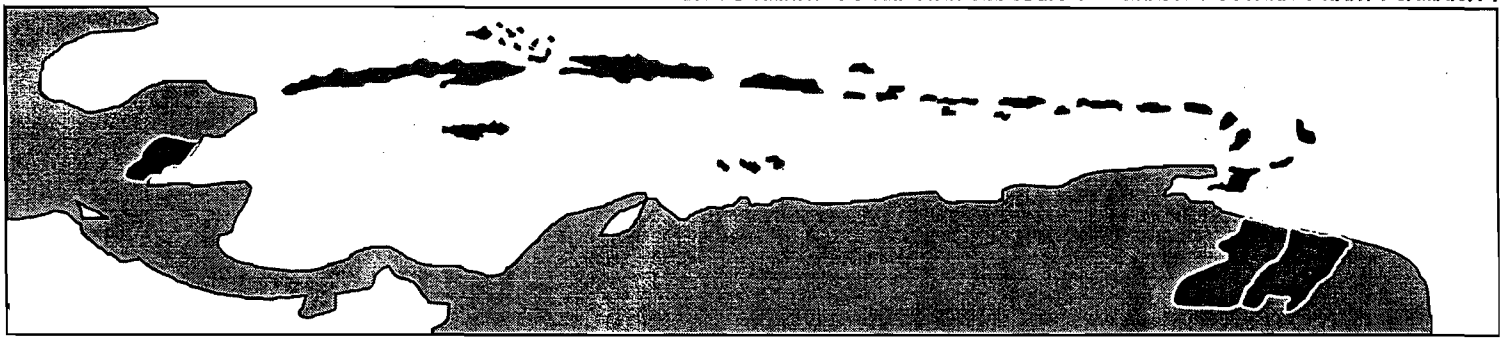

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THE STATUS OF BIODIVERSITY AND BIOPROSPECTING EFFORTS IN THE CARIBBEAN SUBREGION

UNITED NATIONS
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Introduction

Biodiversity, as the name implies, is the term used to describe the differences that exist between and among the various species of organisms on the planet earth. Biodiversity can be measured on a worldwide basis, on a regional basis, on a national basis, as well as on a zonal basis. The interactions of these various species provide the basis for sustaining life, human life in particular. On that basis then, it is of utmost importance that the biodiversity of any area be preserved and this can only be done by a proper understanding of the organisms, their relative positions and interactions, and their contribution to life processes.

Unfortunately, the activities of man, the highest form of life in the biodiversity equation, are the most dangerous to the maintenance of the biodiversity equilibrium. In pursuit of food, shelter and economic greed, man has not only changed the natural populations, but the activities of man have also significantly reduced the number of species in a given area through large-scale agricultural activity, poor agronomic practices, poor soil and water conservation measures, wasteful irrigation practices, the introduction of inorganic pesticides, insecticides, fertilizers and packaging materials, deforestation, alterations to the seashore and the "concretization" of once low-lying lands.

A possibly worse mistake, especially for developing countries, has been the replacement of the word "ecology" with "environment". This replacement has led to a cursory study of the relationships between and among organisms and their environment and has moved to a more confrontational approach to the understanding of these relationships. In addition, an in-depth knowledge of the various organisms interacting in their environment which was a prerequisite for the study of ecology seems to have been lost in the "environment" agenda. Decision-making based on environmental data rather than on ecological studies can be particularly damaging to the very ecosystems that we want to preserve through biodiversity preservation.

The best guarantee of biodiversity is to do nothing to the environment. However, that is not an option since man has to find food and shelter. The next best option, therefore, would be to reduce, as much as possible, the effects of our actions on the species and gene pools. It must be pointed out that the provision of basic food and shelter for man is not in itself detrimental to the biodiversity of any region. In fact, that quest for food and shelter may help the process of biodiversity preservation as the natural culling process will establish homeostatic situations in populations. This is part of the natural cycle of growth. It is the excess of food, shelter and economic greed that seriously disturbs the natural balance and leads to habitat degradation that is detrimental to biodiversity preservation. In the Caribbean, especially in the small States of the subregion, it is probably not fully appreciated that tropical ecosystems are more fragile than their temperate counterparts, in that while there is an abundance of species, the relative number of organisms per specie is quite small. Thus, carrying capacity and over-exploitation levels are reached very quickly and changes in specie numbers occur quite dramatically over time. It is in this context that we need to examine the various activities in the subregion to understand their role in the biodiversity equation.

Global warming and biodiversity

It is safe to say that the phenomenon of global warming, resulting from the activities of man, will affect biodiversity in several ways. It has been suggested that higher temperatures resulting from global warming will produce increased rainfall in areas located near oceans and other large bodies of water. However, inland regions will experience dry conditions. Low-lying areas will be inundated by sea-level rise and hurricanes will increase in both incidence and intensity. The overall effect of all the above will be an alteration in the diversity of organisms and some specie could be eradicated as changes in habitat occur.

Forestry and biodiversity

Although the tropical forest remains the largest land-based source of biodiversity it is not the only source. Unfortunately, early efforts at forest conservation were not aimed at the preservation of biodiversity, but primarily water conservation. There were also economic considerations. This approach has run into the dual problem of agricultural land encroachment and depletion of wood products at the expense of the preservation of species habitat. Although there is a concerted effort to preserve forests in the subregion, the pressures of finding virgin lands to replace nutrient-depleted fields, coupled with the lack of adequate resources and proper management policies continue to deplete forested acreages. Unfortunately, the new lands coming into cultivation are usually for mono-cropping practices, which add to the problem of species loss and a reduction in biodiversity richness. Habitat loss, therefore, either through poor forestry practices or otherwise, continues to be the single most serious challenge to biodiversity in the subregion, and in fact, worldwide.

Agriculture and biodiversity

The first claim on nature's resources is to maintain itself and the second claim is to provide food for the population. Of the relatively large number of plant species, perhaps a few thousand, have been used as foodstuff, and only a percentage of these are nutritionally significant on a global level. Only a very few of these have been intensively managed on a commercial scale. Similarly, very many animal species are eaten, but only a small percentage are globally of nutritional significance. A few dozen species, mostly mammals, are managed in some kind of husbandry system and a handful of these are globally significant. Agricultural activities therefore become an important determinant in the biodiversity discussion and the approach to agriculture becomes critical as either benefit or bane. It is clear that successful cultivation of agricultural crops on a large scale requires a suite of other organisms. Highly productive agricultural systems also require the virtual absence of some elements of biological diversity. Whereas subsistence agriculture utilized a small amount of land and generally allowed land to fallow during cultivation, economic agriculture as practiced in the subregion brought in a tremendous amount of land into cultivation, which sometimes was unsuitable for agricultural purposes. It is now being recognized that some early agricultural practices were more sustainable than some new techniques introduced to farmers, especially with regard to pest and disease control.

Early agriculture in the Caribbean began as a major economic concern in distinctive phases with the production for export of sugar, cocoa, coffee at various times. Sugar was the most prominent and the earliest crop to be established. Sugar was grown on the best agricultural land and a large amount of organic fertilizer was employed to maintain soil fertility. With the islands still virgin territory much of the land area, especially the more mountainous parts, were covered with trees and generally not disturbed by the sugar plantations. With the minimal introduction of pesticides the ecological balances were hardly disturbed, therefore biodiversity was almost intact.

It can be said that the abolition of slavery and the introduction of tree crops for commercial use began the first major phase of change with an increase in peasant farming on the hillsides. The arable bottom land was at that time still owned by the estate owners. The estates also began to encroach on the gentler slopes for the cultivation of coffee, cocoa and coconuts. The estate cultivations required cutting down large areas of forest and for the peasant farmers it involved farming higher and higher on the slopes with "slash and burn" farming methods. Both activities resulted in drastic changes to the ecosystem as micro organisms were destroyed, trees felled and soil erosion became a prominent feature.

This period can be recognized as the beginning of the process of biodiversity metastasis in the region, but up to this time there was not the large-scale introduction of chemicals in agricultural enterprise. It must be pointed out that the peasants cultivated multi-crops on their small parcels and this practice helped, to some extent in the preservation of the biodiversity. In addition, on both the estates and on the peasant farms, there were sufficiently large numbers of animals to provide manure for soil fertility maintenance.

The next stage was the ascendancy of tree crops as the major export crops and the introduction of pesticides, weedicides, and inorganic fertilizer as larger acreages came into cultivation and the supply of manure could not meet the growing demand. At this stage though, there was still a considerable amount of intercropping but the introduction of different varieties considerably affected the biodiversity equation. Unfortunately, with little concern for biodiversity issues, no studies were done to determine specie extinction or other aspects of speciation. For example, some years ago the mongoose was introduced into Saint Lucia in an attempt to reduce the deadly fer-de-lance snake population on that island. The mongoose did an effective job but with a reduced snake population and an increasing mongoose population, the mongoose turned their attention to chicken, small livestock and some crops.

The large-scale introduction of chemicals into the subregion was also devastating to the biodiversity equation and the subregion never got out of that vicious cycle. Not only were micro organisms on land destroyed, but the inorganic chemicals used played havoc on the fauna in the rivers and seas. Although as a subregion there was still diversity of agricultural activities - since only Barbados, Antigua and Barbuda and St. Kitts and Nevis had large-scale monocrop cultivation - the situation changed drastically when banana was introduced as a major cash crop in a mono-culture mode in the Windward Islands and Jamaica. This served to complete what sugarcane had done to Barbados, Antigua and Barbuda and St. Kitts and Nevis and, to a lesser extent Trinidad and Tobago and Guyana. Economics again gained precedence over ecology,

without the recognition that a balanced ecological situation was necessary to sustain economic activity.

Thus, poor planning and policy reduced the very factors that were important to the sustained provision of food and fiber in the Caribbean. It may be argued that the subregion is still able to supply the necessary food and fiber. However, on a country-by-country basis there are visible signs of deterioration in soil fertility, soil erosion and poor crop returns.

Housing and biodiversity

Faster population growth not only puts pressure on agriculture but also on the land area available for housing. For a while increases in agricultural output through monoculture provided the impetus for the demand for housing in the rural areas. The need for a more balanced approach to development was becoming increasingly evident. Also, with the decline in agricultural output, there was migration from the villages to towns and growth of concentrated housing schemes. In time, with increased economic activity these schemes grew not only landward for the beginning middle class but also up the slopes and towards the seashore for the upper class. This acceleration in housing construction created an increased demand for sand, most of which, especially in the smaller islands, came from the seashore. Thus changes in microclimates were affected in both the terrestrial and the marine ecosystems.

Water and biodiversity

Water is the source of life and therefore an important component in the biodiversity equation. In fact, the species diversity of tropical forests is due in large measure to their high rainfall. On small islands though, the water equation is delicate and so is the measure of diversity. With increasing population the same pressures that are exerted on the land area are also exerted on the water supply to meet growing demands. At the same time increased acreage under agriculture decreases the forested areas and reduces the water supply. In addition the introduction of sprinkler technology in irrigation not only adds to the growing water demand but also creates new micro-climates that could bring about species change.

While the damage has been done to the fresh water sources in terms of supply, a different kind of damage is being done to the marine environment that would seriously affect its

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