

# CONTRIBUTIONS OF HUMAN ECOLOGY TO CONCILIATE PEOPLE AND BIODIVERSITY WITH A FOCUS ON FISHING COMMUNITIES

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## Summary

The world's highest priority areas for biodiversity conservation (hotspots) are usually located in tropical developing countries, which typically show an ever-increasing human population, including many poor people, who usually rely directly on extracting natural resources, such as plants, fish, game animals or small-scale agriculture. The discipline of human ecology investigates the several interactions that humans maintain with

ecosystems and other organisms, and may thus provide an important, although not fully acknowledged, contribution to address and to conciliate the conflicting demands of social well being with the need to protect biodiversity. Some of the major research areas of Human Ecology that have been particularly useful to understand the behavior of local people are the subsistence models, niche theory, territoriality, co-management, common based management, cultural ecology and ethnobiology. Studies of Human Ecology have been gathering data on the diversity of natural resources used by local people, as well as about the strategies of resource utilization, through quantitative research methods, such as interviews, systematic sampling of resource use, and surveys of the people's diet (feeding habits). Such an approach has contributed to the study and management of local fisheries in tropical developing countries, where the co-management, which involves the local communities, government and scientists, has shown to be a promising approach to achieve sustainable use of fishing resources. Although there is not a definite answer to the question regarding conservation and local people, the more coherent solution would be to recognize that there would be usually some degree of change or impact on natural ecosystems due to the presence of local people, but to completely exclude or to disregard such people is no longer feasible or desirable, as this would probably result in social and ecological damage on the long run.

## **1. Introduction**

Most of the world's biodiversity is currently threatened and many species have been disappearing before they could be studied and even described. Moreover, the world's highest priority areas for biodiversity conservation (hotspots) are usually located in tropical developing countries, such as the Brazilian's Atlantic rainforest and cerrado, the Indian tropical forests, among others. Such developing countries typically show an ever-increasing human population, including many poor people, who usually rely directly on extracting natural resources, such as plants, fish, game animals or small-scale agriculture. Therefore, biodiversity conservation plans in those countries should deal with local people, especially for those more endangered regions that have been suffering increasing human pressure, such as the Brazilian Atlantic forest.

A growing body of knowledge has accumulated about patterns of use of natural resources by local communities in several tropical and subtropical ecosystems, in Brazil and elsewhere, including small-scale peasant farmers, artisanal fishers, indigenous communities, and even poor people living in the suburbs of large cities. Nevertheless, there remain some gaps on the knowledge about the biological features of exploited species, the dynamics of natural and disturbed ecosystems, the consequences of exploitation to the species exploited and to the biological communities and the intensity and overall trends in resource utilization by local people. In Brazil, as in many similar tropical countries, such lack of data is due mainly to the corresponding lack of financial and personnel resources to conduct the appropriate studies, plus the huge dimensions of Brazil, which sometimes means to cover large distances and to reach remote regions. The problem in getting natural resources' use data is also accentuated by the high diversity of potential useful resources found in many Brazilian tropical regions. Research conducted so far, in Brazil as well as in other tropical countries, focused mostly on the biological aspects of natural resources exploited. However, albeit important, such biological research would be not sufficient to adequately address the

complex issue of sustainable management of natural resources. The discipline of human ecology investigates the several interactions that humans maintain with ecosystems and other organisms, including knowledge about and use of the natural resources. Human ecology may thus provide an important, although not fully acknowledged, contribution to address and to conciliate the conflicting demands of social well being of local communities with the need to protect biodiversity and ecosystem's integrity.

## **2. Local People and Biodiversity**

### **2.1. The Main Issue**

There has been a growing scientific and political debate about how to address the complicated issue of human presence around or inside top priority conservation areas, such as parks, biological reserves, among others. How to deal with those local indigenous or small-scale peasant communities, who have been living in a region and using natural resources, such as fish, game animals or plants, which biologists are desperately trying to protect? Considering a definition of sustainability as using a natural resource in a way that the same resource would be available to be used by future generations, the question could be rephrased: Would it be possible for local communities to use high biodiversity ecosystems in a sustainable fashion? Albeit not simple, this is an increasingly important and demanding question, which biologists, politics, technicians and other people in charge of natural resources' management may no longer be able to avoid.

### **2.2. Local People and Biological Diversity: Friends or Foes?**

Some biologists argue that sustainable use of high biodiversity and complex tropical ecosystems would not be possible, and therefore the conservation of such important ecosystems, such as rainforests or coral reefs, requires banning of all forms of natural resources' collection and even peoples' removal. Albeit such position may seem too radical at first glance, it has been supported by scientific data, which indicate several kinds and levels of impacts that even local people using simple techniques to exploit natural resources have been exerting on the animals, plants, and ecosystems exploited. For example, indigenous communities have been eliminating entire populations and species of large and medium mammals from some tropical forest sites (especially islands or fragmented habitats), local artisanal fishermen have been depleting and over-fishing fishes and other aquatic animals (turtles and manatees), especially in tropical reefs and estuaries. Furthermore, increasingly historical evidence provided mainly from archeological and paleoecological studies indicate that ancient and traditional human societies depleted important biological resources long time ago. Indeed, such same evidence indicate that unsustainable use of natural resources and ecosystems could have been at least partially responsible for the collapse of some of these former human societies, such as the Mayas of Central America or the people from Easter Island, in the Pacific.

By other hand, several biologists, ethnobiologists and anthropologists affirm that those local people who have been living and managing their natural resources and habitats for a long time acquired a detailed biological knowledge and developed wise management

strategies, allowing those local communities not only to maintain, but sometimes even to enhance the local biodiversity of terrestrial and aquatic ecosystems. As well as observed for biologists contrary to the presence of local people in conservation areas, those ‘people friendly’ researchers have also sound arguments and scientific data to support their positions. For example, several places held today as ‘pristine’ tropical forest, in Amazon, Brazilian *cerrado* and other inaccessible regions, may be in fact a result of indigenous management techniques, including planting of fruit trees, clearance and posterior regeneration of pristine forest, systematic burning of vegetation, and so on. Indeed, local people, such as small-scale farmers, have been generating biodiversity through the selective breeding of several species and varieties of cultivated plants over hundreds or thousands of years. Also, the presence of traditional people in an important conservation site may also prevent other forms of economic development and resource use, which would be much more damaging to natural ecosystems, such as large scale mining, fishing, timber extraction, urban development, industrial facilities, large barrages and forest conversion to pasture or large scale agriculture, which its accompanying pollution by pesticides and other chemicals. And finally, there has been increasingly recognized that several local or traditional communities have developed elaborated systems of natural resources management (see discussion bellow), which may, intentionally or unintentionally, promote sustainable use of natural resources.

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### **Biographical Sketches**

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