WHY A BRAZILIAN PROGRAM ON CONSERVATION AND MANAGEMENT OF AQUATIC ECOSYSTEMS?

F.A.R. Barbosa

Department of General Biology, Federal University of Minas Gerais,
P.O. Box 486, 31271-970 Belo Horizonte, Minas Gerais, Brazil

SCIENTIFIC BASIS

As pointed out by JUNK (1983), it seems to be generally accepted that the protection of the terrestrial environment automatically includes an adequate protection of aquatic habitats. In the Brazilian Amazon, the creation of Parks and protected areas is based mainly on the theory of Pleitocene refugia(WETTERBERG et al. 1976 e 1981; WETTERBERG & PÁDUA, 1978). However, the theory of refugia is based only on the distribution pattern of a limited number of taxonomic groups of terrestrial plants and animals (JUNK, 1983), and is not therefore, necessarily applicable to aquatic organisms and systems.

Programs for the protection of terrestrial environments do not necessarily protect aquatic systems. A good example is given by the recent workshop entitled "Priority Areas for Conservation in Amazonia", held in Manaus in January 1990. According to RYLANDS (1990), the basic parameters used to identify key areas for biological conservation were endemism and species richness with complementary consideration given to the occurrence of rare or threatened species, the presence of unusual geological or geochemical features, and the current state of disturbance and threat to the area.

Although a number of areas were chosen by the vegetation types working group on the basis of the occurrence of inundated forest, important for Amazonian fish communities, a comparison of the priority areas as defined in that meeting shows how difficult it is to produce a reliable definition of conservation areas for the fish communities, the only representative aquatic group considered by the participants. This forcibly illustrates the need for a conservation

program of aquatic systems which takes into consideration other parameters, including entire catchment basins and water use, as well as socio-economic aspects.

Considering the effects of climatic changes, the supposed reason for the formation of refugia, as well as the changes in total discharge and patterns of water level fluctuations, it is very likely that river systems and aquatic habitats in general were not significantly affected in terms of their fauna and flora. On the other hand, these habitats and their communities have been drasticaly affected by human actions. Eutrophication, silting and varied forms of pollution are well known examples worldwide.

Furthermore, adequate supplies of fresh water are essential not only to support human and other life forms, but also for numerous industrial and agricultural purposes (UNEP, 1991/1992). This must be considered in conjunction with the steadily increasing demand (= withdrawals) since the 1960s which in Brazil, according to this report, were in 1987, 43%, 40%, and 17% for domestic, agricultural and industrial purposes, respectively.

Brazil has the largest renewable water resources in South America (6,950 km^3) and still a modest per capita consumption of 212 m^3 per year, thus demonstrating so far a sufficiency in water reserves. However, special concern is needed when considering the situation worldwide. Withdrawal for industrial purposes is currently estimated to be about 760 km^3 per year; for Europe alone the demand for industry exceeds that for agriculture. Furthermore, waste waters from industrial uses total some 660 km^3 per year (Belyaev, 1990, cited in UNEP, 1991/1992), most of which are heavily contaminated with chemicals and trace metals, and subsequently discharged without treatment into rivers and coastal waters.

According to this Report in 1985, 25% of the urban population in Latin America and the Caribbean lacked drinking water and 40% lacked sewage systems, with almost none of the household and industrial wastes treated before being dumped into bodies of water.

Considering the profound scientific and technological advances we are experiencing today, and their repercussions on socio-economic and social relations and, more particularly, the economic changes that have

been imposed on Brazilian society in order to accomplish modernization, it is imperative to consider water policy as a basic tool for sustainable development.

To accomplish this we must establish viable and creative regional strategies centred on the conservation and management of our water resources in order to guarantee their maintenance to support a sustainable growth and a future for the coming generations.

MAJOR IMPACTS TO BE CONSIDERED

Among several impacts common to the majority of the natural and artificial water systems throughout Brazil, those listed below deserve special attention considering their importance for the protection and conservation of aquatic communities:

— Eutrophication/urbanization, especially important in the areas of fast growing cities, threatening mainly drinking water supply sources

— Erosion/filling in, despite the scarce data an example may be given of the river Teles Pires catchment basin which has already lost 50,000 ha of good agricultural soil (PÁDUA & DOUROJEANNI, 1991).

— Agricultural activities, especially monocultures, of which *Eucalyptus* spp. and *Pinus* spp. plantations occupy six million ha, with an annual increment of 400,000 ha (ABRACAVE, 1990).

— Mining activities, especially for gold and bauxite, predominant in the north (e.g., Madeira river) and in the Pantanal region. There are 4.5 million goldminers in the Amazon region alone, making this activity a major ecological problem in the area (PÁDUA & DOUROJEANNI, 1991).

— Dams and impoundments, mainly considering that the demand for electricity growth is increasing at a rate of 5.6% a year, and the total generation should grow from 43 GW in 1986 to 160 GW in 2010. A revision of the 2010 Plan of Eletrobras (Brasil-MINFRA, 1990) has determined the building of 65 new dams, adding 13,191 km^2 of reservoirs (an increase of 55% to the present area flooded).

— Loss of biodiversity within aquatic systems, a neglected area of

study although preliminary research is already demonstrating the disappearence of species, including those at the base of food-chains.

— Pollution in general, emphasizing the widespread use of agrotoxic chemicals, and the huge amounts of mercury and oil spilt as a result of mining activities. In the Madeira river alone an estimated 5 million litres of oil were discharged or spilt in 1989 by the 6,000-7,000 dredges operating (PADUA & DOUROJEANNI, 1991).

THE GOALS SHOULD BE

1. The control of eutrophication and the restoration of degraded systems.

2. Development of a feasible monitoring program for water quality (currently including cholera).

3. Identification of management proposals.

4. Definition of multiple uses of dams and impoundments.

PHASES OF THE PROGRAM

1. Identification of the priority systems.

2. Inventories and general characterization, considering the interfaces between adjacent systems and communities.

3. Development of comparative studies and organization of a data bank.

4. Definition of management proposals and sustainable exploitation of the resources, with special consideration for regional socio-economic studies.

EXPECTED RESULTS

It is hoped the workshop will offer a chance to discuss such important aspects as decreasing diversity within aquatic systems, and that the final document will also demonstrate the lack of basic information in this and related fields. Furthermore, it will show for the first time in Brazil that a combined ecological and socio-economic approach is the only means for solving the problems involved, including

eutrophication and water-borne diseases, and especially considering the present uses of the major water systems.

This document will be offered to governmental and non-governmental organizations to help in the definition of policies related to the sustainable exploitation of aquatic resources, including restoration measures for degraded areas. It will also include a scientific basis for the elaboration of a proposal for a "Clean Water Act" to be discussed, and hopefully approved, at the appropriate political levels.

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