# Developing policies for the management of fishery genetic resources

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## 1. SUMMARY

Policy on aquatic genetic resources is primarily guided in FAO by the Code of Conduct for Responsible Fisheries and the Convention on Biological Diversity. These instruments are complementary and both recognize the importance of sustainable use and conservation of aquatic genetic resources. Policies will be influenced by a number of drivers that include the increasing human population, resource limitations, the need to address broad and complex social issues, intensification of farming and fishing systems, increases in technology, and the recognition of sovereign rights of countries in regards to aquatic genetic resources.

## 2. INTRODUCTION

The Preamble to the 1989 edition of the Constitution of the Food and Agriculture Organization of the United Nations defines the common purpose of the Nations accepting the Constitution as:

- raising levels of nutrition and standards of living of the peoples under their respective jurisdictions;
- securing improvements in the efficiency of the production and distribution of all food and agricultural products;
- bettering the conditions of rural populations; and thus
- contributing toward an expanding world economy and ensuring humanity's freedom from hunger.

The Fisheries and Aquaculture Department of FAO promotes sustainable and responsible fisheries through its work to improve policy, legislative and institutional frameworks, to develop and evaluate technologies in fisheries and aquaculture, to build capacity and to collect and disseminate information on the world's fisheries and aquaculture. In 1995 the FAO Council adopted the FAO Code of Conduct for Responsible Fisheries (CCRF) (FAO, 1995) that has since become the framework and primary mechanism through which Member Governments have addressed the above issues. The vision of the Fisheries and Aquaculture Department is: *A world in which responsible and sustainable use of fisheries and aquaculture resources make an appreciable contribution to human well-being, food security and poverty alleviation.* Working through Governments and appropriate Ministries, the Fisheries and Aquaculture Department acknowledges a focus on fishers and fish farmers.

Collecting information on the status and trends of aquatic genetic diversity is extremely difficult, especially for global repositories of this information such as FAO. The FAO Fisheries and Aquaculture Department receives yearly information on fisheries and aquaculture production from Member Countries. Although this data set represents the *best available scientific information* it is far from complete and includes virtually no information below the species level. Indeed much of the reported information is not identified to species (especially true for inland fishery resources). A disturbing trend is that the quantity of production not reported at the species level is increasing (FAO, 2004). Countries are better at reporting aquaculture production by species, but not by strain, breed, or variety. Thus, we have scant global information on the numerous breeds of carp, catfish, tilapia and other genetically altered species that comprise aquaculture production.

Management of the resources and collection of information from areas beyond national boundaries are further complicated by problems of governance and jurisdiction. Regional fishery bodies have been established in some marine and inland areas. However, there are gaps in coverage and problems with implementation of regional agreements.

## 3. CODE OF CONDUCT FOR RESPONSIBLE FISHERIES (CCRF) AND OTHER INTERNATIONAL MECHANISMS

The CCRF is a voluntary, non-binding international instrument that the Members of FAO have pledged to help implement as appropriate and to the best of their abilities. Articles of the CCRF relevant to FiGR include:

- **Article 6.2 –** Fisheries management should promote the maintenance of the quality, diversity and availability of fishery resources in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development. Management measures should not only ensure the conservation target species but also of species belonging to the same ecosystem or associated with or dependent upon the target species.
- **Article 7.2.2 –** …biodiversity of aquatic habitats and ecosystems is conserved and endangered species are protected.
- **Article 9.1.2 –** States should promote responsible development and management of aquaculture, including an advance evaluation of the effects of aquaculture development on genetic diversity and ecosystem integrity, based on best available scientific information.
- **Article 9.3.1 –** States should conserve genetic diversity and maintain integrity of aquatic communities and ecosystems by appropriate management (in particular to minimize adverse impacts from non-native and genetically altered species).
- **Article 9.3.3. –** States should …encourage the adoption of appropriate practices in the genetic improvement of broodstock, ….
- **Article 9.3.5 –** States should, where appropriate, promote research and, when feasible, the development of culture techniques for endangered species to protect, rehabilitate and enhance their stocks, taking into account the critical need to conserve genetic diversity of endangered species.
- **Article 12.8 –** States should conduct research into, and monitor, human food supplies from aquatic sources …and ensure that there is no adverse impact on consumers.

The Fisheries and Aquaculture Department works in close association with a variety of international mechanisms and agencies. The key mechanism relevant to the issue of aquatic genetic resources and biodiversity is the Convention on Biological Diversity (CBD). The FAO CCRF, as well as the CGRFA, have similar principles with, and are complementary to the CBD. Key sections of the CBD that pertain to aquatic genetic resources and biodiversity are:

- **Article 6 –** Each Contracting Party shall, in accordance with its particular conditions and capabilities: (a) Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this

purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned; and (b) Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.

- **Article 7 – Monitoring:** (a) Identify components of biological diversity important for its conservation and sustainable use having regard to the indicative list of categories set down in Annex I; (b) Monitor, through sampling and other techniques, the components of biological diversity identified pursuant to subparagraph (a) above, paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use; (c) Identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, and monitor their effects through sampling and other techniques; and (d) Maintain and organize, by any mechanism data, derived from identification and monitoring activities pursuant to subparagraphs (a), (b) and (c) above.
- **Article 8 – *In situ* conservation:** (g) Establish or maintain means to regulate, manage or control the risks associated with the use and release of living modified organisms resulting from biotechnology which are likely to have adverse environmental impacts that could affect the conservation and sustainable use of biological diversity, taking also into account the risks to human health; (h) Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species; (i) Endeavour to provide the conditions needed for compatibility between present uses and the conservation of biological diversity and the sustainable use of its components.
- **Article 9 – *Ex situ* conservation:** ( a) Adopt measures for the ex-situ conservation of components of biological diversity, preferably in the country of origin of such components; (b) Establish and maintain facilities for ex-situ conservation of and research on plants, animals and micro- organisms, preferably in the country of origin of genetic resources; (c) Adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions; (d) Regulate and manage collection of biological resources from natural habitats for ex-situ conservation purposes so as not to threaten ecosystems and in-situ populations of species, except where special temporary ex-situ measures are required under subparagraph (c) above …
- **Article 10 – Sustainable use**: b) Adopt measures relating to the use of biological resources to avoid or minimize adverse impacts on biological diversity; (c) Protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements; (d) Support local populations to develop and implement remedial action in degraded areas where biological diversity has been reduced.
- **Article 15 – Access to genetic resources:** Recognizing the sovereign rights of States over their natural resources, the authority to determine access to genetic resources rests with the national governments and is subject to national legislation.

Other key international mechanisms include CITES, the Ramsar Convention on Wetlands, the United Nations Convention on the Law of the Sea, UNESCO and its International Oceanic Convention. Recently, the World Summit on Sustainable Development,[1] the Millennium Development Goals,[2] and the Millennium Ecosystem

[1] http://www.unep.fr/outreach/wssd/postjoburg/wssdoutcomes.htm
[2] http://www.un.org/millenniumgoals/

Assessment[3] have introduced broad goals into the international development arena. Specific goals have been identified in high priority areas such as Africa.[4]

## 4. DRIVERS IN THE INTERNATIONAL POLICY SECTOR

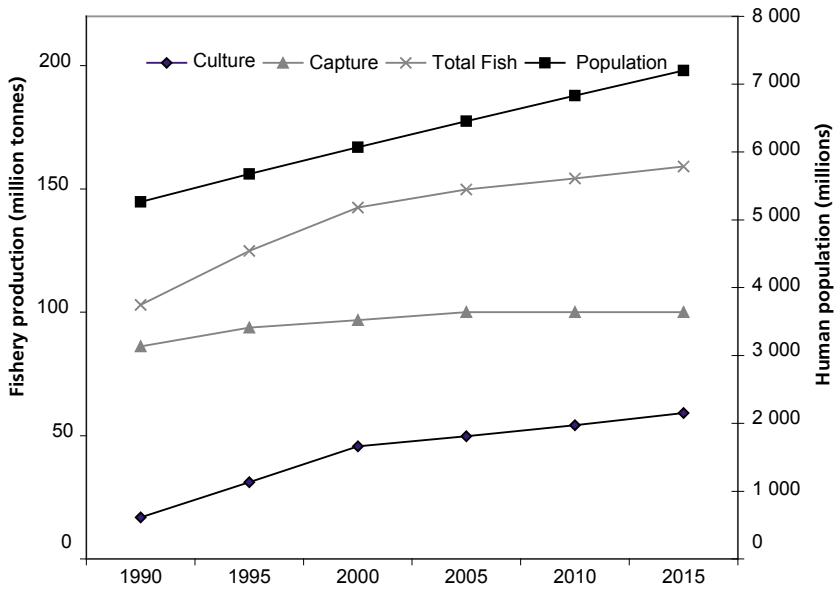
The following trends may act as drivers of change in the use and value of aquatic genetic biodiversity and how international agencies deal with the changes.

### Trends in human, economic and biodiversity resources

The production from capture fisheries has levelled and significant increases in production are expected to come primarily from aquaculture (Figure 1). Of the world's major marine fisheries, the percentage of over-exploited, depleted or recovering stocks has increased from about 10% to 28% from 1974 to 2003. During this time under to moderately exploited stocks have decreased from about 40% to 24%, and fully exploited stocks have remained fairly constant at 50% (FAO, 2004).

Aquaculture is the fastest growing food producing sector with an average rate of increase of about 9% over the last two decades (FAO, 2004). Much of this growth has been in developing countries. Today, nearly one of every two fish consumed with be farm-raised (FAO, 2006a). It is further expected that per capita consumption of fish will increase to about 16kg/yr by 2015 (FAO, 2004). With an ever growing human population, fishery production will need to increase to meet these expectations. In response, intensification of farming systems, exploration of new areas and improvement of fishery management are being employed. Intensification has also involved genetic

FIGURE 1
**Production from capture fisheries and aquaculture, and human population growth**




[3] http://www.eco-index.org/search/pdfs/millenium_ecosystem_assessment.pdf

[4] The New Economic Partnership for African Development Action plan for the Development of African Fisheries and Aquaculture. http://www.iss.co.za/Af/RegOrg/nepad/fishplan.pdf

alteration of species to be consumed. This has led in some cases to a fear of products derived from modern biotechnology.

### Trends in technology

At present there is substantial technical ability to identify, characterize and manipulate genetic biodiversity, although it is often not used or is expensive to use. Technology exists that allows genes to be transferred across taxonomic kingdoms, e.g. fish anti-freeze protein genes that have been inserted into strawberries; micro-satellite markers can trace family pedigrees or identify stock structure in wild populations (Liu, 2007), and the products of individual genes can be identified and crafted to meet certain needs. Improvements in technology have increased our ability to perform these manipulations and analyses and have lowered the cost of doing so. Although much of this technology is in developed countries, numerous developing countries have this capacity and many others are seeking it.

### Societal trends

In response to the above increase capacity in technology, there has been increased attention given by consumers, non-governmental organizations, and other interests groups to human health safety, environmental safety and ethical concerns associated with genetic manipulation and consumption of fish and fish products. Many of the human health concerns stem from highly publicized aspects of plant genetic engineering where the products of the modification are toxins or resistance to toxins, e.g. herbicide resistant soybeans or Bt-cotton.

### From common heritage to sovereign rights

With the signing of the CBD and the CCRF, the international community acknowledged the value of biological diversity and genetic resources in helping improve the human condition. Whereas previously genetic resources were considered to be the "heritage of mankind", these new instruments now recognize the sovereign rights of States to manage their own resources and control access to them (CBD, 1994).

### Recognizing stocks and strains

Responsible management of aquatic genetic resources will require information on stocks, strains, and important breeds of aquatic organisms (Grant, 2007; Pullin, 2007; Smith, 2007). Important stocks of marine species have been defined and assessed as to their status, i.e. depleted, recovering, sustainably harvested, over-fished. Some National Governments are granting species status to sub-species and stocks as in the United States of America where the government affords protection to endangered runs of Pacific salmon as species under the USA Endangered Species Act.[5] Breeding centers in Eastern Europe maintain detailed information on strains of common carp (Bakos and Gorda, 2001), and registries of common aquaculture species exist in the United States of America;[6] these are exceptions however, to the general lack of information below the species level.

### From simple to complex issues

Although basic information on aquatic genetic resources and biodiversity is extremely important and much work still needs to be done to assess their status and trends,

[5] See listing of specific stocks of coho salmon in Oregon and California, United States of America. http://www.fws.gov/endangered/federalregister/1997/f970506.pdf

[6] See National Fish Strain Registry at http://www.nbii.gov/images/uploaded/151813_1159742065258_FARStrategicPlan.pdf

numerous international and donor agencies and conventions are now stressing the important role that these resources play in poverty reduction, human health, and ecosystem functions (see for example Toledo and Burlingame (2006) and references therein). The complex issues of poverty and livelihoods are becoming superimposed on the technical issues of genetics and biodiversity. The CBD, CG Centers and FAO are working to document not only the aquatic animal diversity found in rice fields, but also the key nutrients such as fatty acids, minerals (Toledo and Burlingame, 2006). While this trend is expected and reasonable, it puts added importance to accurate assessment of aquatic resources for food and aquaculture.

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