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Access to and protection of aquaculture genetic resources — Structures and strategies in Norwegian aquaculture

Ingrid Olesen [a,*], G. Kristin Rosendal [b], Morten Walløe Tvedt [b], Martin Bryde [b], Hans B. Bentsen [a]

[a] *AKVAFORSK, P.O. Box, N-1432 Ås, Norway*
[b] *The Fridtjof Nansen Institute, P.O.Box 326, N-1326 Lysaker, Norway*

Abstract

Breeding companies need protection for genetic material to assure revenues from genetic improvement and investment. Fish farmers and fish breeders need access to genetic resources for food production and further development and sustainable use of fish genetic material. In Norway, access legislation is now in the process of being developed. The objective of this paper is to discuss some of the main challenges associated with access to and protection of fish genetic resources in aquaculture. In an interdisciplinary study, we combine expertise on fish breeding and genetic resources with that on law and political science regarding regimes for resource management. Our material is drawn from a number of interviews with individuals directly involved in fish breeding and farming. Our most significant finding is that there is a discrepancy between the knowledge of farmers and breeders with respect to access and legal rights to genetic resources and the actual possibilities and limits offered by today's and forthcoming legislation. In order to maximize the industry's potential, there seems to be a need for information about access and legal rights to genetic resources. Market consolidations and privatisation are among the factors that are recognised as most important in changing the ground rules within the sector. Although the similar history of the plant and agricultural sector does not seem to have a high visibility among fish farmers and breeders, most are becoming more concerned with the questions of access to and protection of the wild and improved breeding material that is central to their trade. This realisation is predominantly linked to external use of Norwegian salmon genetic resources, as most breeders are still confident in the superiority of their own breeding populations. Nevertheless, the breeders also acknowledge their vulnerability, should access to new and improved materials or traits become severely restricted. The predominant view among our respondents is that the sector needs to find a balance between access to breeding material and protection of proprietary innovations in fish breeding. Coupled with this view is an emerging realisation that the value of improved breeding material invariably is underestimated, leaving the farmers to reap most of the added value from fish breeding and farming. Against this background, an interest in finding some way of capturing the value of the improved stocks is emerging among the fish breeders.
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1. Introduction

A challenge in fish breeding rises from issues of access and exclusive rights to genetic resources. Breeding companies need some form of legal or biological protection measures to assure revenues from genetic improvement and investment in genetic material. Fish farmers and fish breeders need access to genetic resources for food production and further development and sustainable use of fish genetic material. How can a balance be created between the need for unencumbered

* Corresponding author. Tel.: +47 64 94 8092; fax: +47 64 94 9502.
E-mail address: ingrid.olesen@akvaforsk.no (I. Olesen).

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and free access on the one hand and the need to ensure a right to the results from breeding and research on the other?

The objective of this paper is to discuss some of the main challenges associated with access to and protection of fish genetic resources in aquaculture based on international and domestic regulations and interviews with representatives from fish breeding companies in Norway. We will present three dimensions that presumably affect choices pertaining to protection and the scope for access to fish genetic resources: First we look at international and domestic regulations and awareness among fish farmers and breeders about the emerging regulations for genetic resources. The second dimension represents the evolving structures within the aquaculture sector itself. Size, private or public ownership and funding may affect how actors regard their strategic option. Third, we examine how technological developments and biological features present options and barriers, which also will affect choices relating to access and property rights issues pertaining to fish genetic resources. In this third section, we discuss in depth the options available.

Only 5–10% of total aquaculture production is based on genetic material that has been improved by systematic family selection programs (Gjedrem et al., 2005; Gjedrem, 2005). This varies between species, but a central question is why the interest for investing in genetic improvement in aquaculture species is so low compared to other domesticated species, e.g. plants and livestock.

Within the plant breeding sector, legal mechanisms for access and exclusive rights have been developed over a long period of time. For example, the US Plant Patent Act dates back to 1930 (Hallerman and Kapuscinski, 1990). The most important property rights to genetically improved plant varieties are based upon the plant breeders' rights as set out in the various editions of the International Union for the Protection of New Varieties of Plants (UPOV) conventions since 1961. Plant varieties that are considered as *new*, *distinct*, *uniform* and *stable* can be subject to a partly exclusive right to commercial uses. More recently, the UN Food and Agricultural Organisation (FAO) has concluded an International Treaty for Plant Genetic Resources for Food and Agriculture[1] 2004 (ITPGRF), which regulates exchange, access and benefit sharing for some of the most important food plants. While these regimes are aimed at plants specifically, the Convention on Biological Diversity (CBD, Rio 1992[2]) and the patent system regulate more general aspects relating to our case study. The scope of the CBD covers both wild species and improved breeding stocks, and equitable sharing of benefits derived from the use of world's genetic resources. Patents apply to inventions in biotechnology and to biological material when the invention fulfils the general patent criteria of novelty, practical usefulness and non-obviousness (Benson, 1986; Office of Technology Assessment, 1989; Hallerman and Kapuscinski, 1990). Access or exchange of fish genetic resources and legal protection of investments and research in aquaculture have not been addressed extensively (Greer and Harvey, 2004; p. 5). However, Rosendal et al. (2006) recently outlined the rationale for ensuring access to and use of legal measures for protection of breeding materials in aquaculture.

As emphasized by Rosendal et al. (2006), fish biology shares some features with plants and some other features with terrestrial farmed animals. The extremely high fecundity and reproductive capacity is more similar to the characteristics for plant species and provides a great potential for breeding and intensive selection. However, plant varieties are often formed as a result of homogenizing processes like inbreeding and vegetative propagation. Accumulation of inbreeding does not seem to impair the viability and performance of selfing plants as is normally seen in outbreeding animals. The results are often highly uniform plant varieties, both phenotypically and genetically, that may be characterized in terms given by the UPOV (*new*, *distinct*, *uniform* and *stable*).

Deliberate or unintended inbreeding has been practised in fish breeding — but often with severe inbreeding depression as a result (Kincaid, 1983; Eknath and Doyle, 1990; Bentsen and Olesen, 2002). Genetic improvement programs for fish will aim at minimizing inbreeding and maintaining as much genetic variation as possible within the population. Hence, the populations will not be *uniform* and *stable*, but variable and evolving from generation to generation. Thus, there are important differences between plant and fish populations in terms of phenotypic and genetic characterization. The legal framework that has been developed for protection of plant varieties can therefore not be applied directly to fish populations.

Nevertheless, the issues of access to, exchange of and exclusive rights to investment and breeding results are important also within the aquaculture sector. There is

[1] FAO International Treaty on Plant Genetic Resources for Food and Agriculture, signed for adoption in Rome 2001. For more information, see http://pgrc3.agr.ca/itpgrfa/info_e.html.

[2] Convention on Biological Diversity, signed in Rio de Janeiro in 1992, entered into force in 1993, presently ratified by 189 parties/member states. For further information, see www.biodiv.org.

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