# Quality norms for aquaculture products: Trends on restriction problems

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**Marketing of aquaculture products**

**Zaragoza : CIHEAM**
**Cahiers Options Méditerranéennes; n. 17**

**1996**
pages 85-92

# Quality norms for aquaculture products: Trends on restriction problems

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**SUMMARY** - The international trade of aquaculture products to increase food production and income has been an established practice since last century. The practice generates controversy with regard to protection of native biological diversity, spread of disease, and socio-economics. The impact and benefits of such trade are unclear, however, planning, regulating and monitoring the international trade of aquaculture products appears to have been poor. It is recommended that this situation be corrected through adherence to international and national codes of practice in order to maximize the benefits from the use of aquaculture products. Many of the issues related to the food product safety and quality of the results of aquaculture are covered by the existing FAO/WHO Internationally Recommended Codex Standards and codes of Practices for Fish and Fishery Products. In addition, a number of other codex committees have relevant issues under active consideration. These include the Codex Committees on Food Hygiene, Pesticide Residues, Food Additives and Veterinary Drug Residues. A Draft code of Hygiene Practice for the Products of Aquaculture was prepared by FAO and is presently under review aiming at including HACCP (Hazard analysis and critical control point) principles into the document. This paper presents a review of international and national efforts concerning the regulation of quality and safety aspects for the production and trade of aquaculture products for human consumption.

**Key words:** Aquaculture, quality norms, safety.

***RESUME*** *- "Normes de qualité pour les produits aquacoles: Tendances concernant les problèmes de restrictions". Le commerce international des produits aquacoles visant à l'augmentation de la production alimentaire et du revenu est une pratique établie depuis le siècle dernier. Cette pratique crée une certaine controverse en matière de protection de la diversité biologique autochtone, de dissémination des maladies, et d'aspects socioéconomiques. L'impact et les bénéfices de ce commerce ne sont cependant pas clairs; la planification, la régulation et le suivi du commerce international des produits aquacoles semblent avoir été déficients. Il est recommandé que cette situation soit corrigée en adhérant aux codes de pratique internationaux et nationaux afin de maximiser les bénéfices provenant de l'exploitation des produits de l'aquaculture. Une grande partie des thèmes relatifs à la sécurité des produits alimentaires et à la qualité des performances de l'aquaculture sont envisagés dans le Codex de normes internationales de la*

*FAO/OMS existant, et également dans les Codes de Pratiques pour le Poisson et Produits de Pêcherie. De plus, plusieurs autres comités du Codex sont en train d'étudier activement d'autres questions d'importance. Parmi eux les comités du Codex sur l'Hygiène des Aliments, les Résidus de Pesticides, les Additifs Alimentaires et les Résidus de Produits Pharmaceutiques Vétérinaires. Un avant-projet du code de Pratique Hygiénique pour les Produits Aquacoles a été élaboré par la FAO et est actuellement à l'étude, afin d'inclure les principes de l'Analyse de Risques et de Points Critiques de Contrôle (HACCP) dans le document. Cet article passe en revue les efforts à l'échelle internationale et nationale concernant la régulation de la qualité et des aspects de sécurité pour la production et le commerce des produits de l'aquaculture destinés à la consommation humaine.*

***Mots-clés :*** *Aquaculture, normes de qualité, sécurité.*

## INTRODUCTION

Consumption of fish and fishery products is associated with a variety of human health hazards, and broadly the same hazards are present in farmed fish as they are present in corresponding fish varieties caught in the wild. In addition, farmed fish may have particular hazards. The only possible consequence is the presence of residues of veterinary drugs used for the treatment of fish diseases. The risk of harm from a particular hazard might be increased under some circumstances in aquaculture products, compared with fish caught in the wild. In some aquaculture systems the use of animal, including human, manures, deliberately added as fertilizers or present adventitiously with the natural situation, might increase the risk of cross-infection of pathogens within a population of fish (Howgate, 1995).

The aquaculture industry has an excellent record regarding the production of safe, quality products. In fact, the consistency of the product quality has been one of the factors making aquaculture so attractive. As the industry assumes an expanding role in meeting consumer's demands for fishery products, it will come under increased scrutiny by national agencies and international organizations whose responsibilities are to be alert for potential problems in food production and processing, and to a possible extent, minimize them through regulation (Ward, 1989).

Throughout the world, aquaculturists are proud of their accomplishments and have strived to distinguish their products from those of the wild harvest. As overfishing occurs, and natural stocks are depleted, great pressures persist to engage in fraudulent activities to substitute lower value species for those of higher value, including those of aquaculture origin (Garrett & Jahncke, 1994).

The use of exotic species to increase fish production is an established practice in the international trade of aquaculture products. Nowadays, large scale movements of many different species and over great distances are possible. The practice generates controversy in regard to the protection of native biological diversity, spread of disease, and socio-economics (Bartley & Subasinghe, 1995). The trade of aquaculture products

and, in particular that of live fish as eggs, larvae or juveniles between geographic regions provides the potential for parallel movements of pathogens. Unfortunately, numerous cases of spread of infective aquatic animal diseases, which can be directly related to international trade movement, exist. A number of national and international initiatives have been recently developed to control this risk (Håstein, 1995).

## CONSUMER'S HEALTH ASPECTS OF AQUACULTURE PRODUCTS

### The HACCP approach

According to modern public health concepts of prevention and control of food borne diseases, consumer hazards derived from food intake should be considered under a HACCP (Hazard Analysis Critical Control Point) perspective. As we all know, HACCP is a non-traditional industry driven system. It assures safe and wholesome products. The system is preventive in nature and truly separates the nice from the necessary to prevent major errors. It applies from production to consumption and its seven basic principles, i.e. hazard analysis, identification of critical control points (CCPs), establishment of critical limits, establishment of monitoring procedures, determination of corrective actions, recording and record keeping, and establishing of verification procedures, should be established in a specific HACCP plan to be applied in each facility. The system is unique to each product and to each facility and should be designed and implemented by the industry/producer.

When a hazard analysis vs. the end-use of aquaculture products are generically applied, one may conclude that: first, with the exception of those products eaten raw, in particular molluscan shellfish, aquaculture presents no more, and perhaps even less, of a safety risk than wild animals; secondly, aquaculture products may represent some unique risks such as antibiotic residues, herbicides, etc. (Garrett & Jahncke, 1994).

A draft Code of Hygiene Practice for the Products of Aquaculture was prepared by FAO and is presently under review, aiming at including HACCP principles into the document. The new text will give particular attention to biological agents such as bacteria (Salmonella spp, Shigella spp, Vibrio spp) and parasites (Clonorchis sinensis, Opisthorchis spp) of human health significance, chemical contaminants (heavy metals, agricultural pesticides, industrial chemicals) and residuous of veterinary drugs (antibiotics, parasite control agents). The new code will stress the importance of identifying if the aquaculture product is used in a way which increases the risk of harm to the consumer, or if the product is particularly used by consumers who are especially susceptible to a hazard. As far as preparation for consumption is concerned, aquaculture products are generally not treated differently from the equivalent products harvested from the wild. Nevertheless, the HACCP plan must determine if a particular product is likely to be consumed without a prior process that would inactivate biological agents (ex.: cooking) and bear this in mind when developing the HACCP plan (Howgate, 1995).

The industry/government in USA have succeeded in the development of comprehensive HACCP plans for selected aquaculture products, i.e. catfish, crawfish, molluscan shellfish (NMFS, 1991). The application of the HACCP system to US catfish farming and processing in the state of Mississippi, USA, is described in an excellent video show prepared by the University of Southern Mississipi.

Since the application of the HACCP system by industry is the most effective means of assuming safety and quality of foods, all aquaculture production facilities must undertake the necessary steps to gain knowledge and adopt responsibilities of the HACCP system as it applies to their specific commodity and operations (NMFS, 1991).

**Regulation of chemicals for aquaculture use**

The close confinement of aquaculture provides circumstances under which stress is a common phenomenon, and the transmission of disease is relatively easy. Therefore, fishculturists rely on approved chemicals to overcome unavoidable problems. For example, certain chemicals are used as anaesthetics to reduce trauma to animals; disinfectants are used to remove pathogens, and antiseptics, antibacterial, viricides, fungicides and parasiticides are used to control specific disease organisms. Additionally, chemicals are often used to improve water quality, to remove or to control algal blooms or vegetations, or to remove nuisance aquatic organisms. However, the use of these chemicals must not contaminate the human food supply and the natural ecosystems. To ensure safety of the food supply, national agencies and international organizations must regulate the aquaculture industry (Fong & Brooks, 1989).

If an aquaculture pond is to be constructed on agricultural land, soil must be tested for pesticide residues, particularly for persistent pesticides. Transfer of pesticide residues from soil to animals, through water, must be avoided. Chemicals introduced via construction materials, such as stabilizers, pigments, antioxidants, and antifouling compounds, also could be harmful. Potential health hazards introduced by pesticides and construction chemicals into the human food supply need to be carefully evaluated (Fong & Brooks, 1989).

The lack of approved drugs for disease control has been cited as a primary obstacle to develop aquaculture production. Many drugs currently used in aquaculture do not have established withdrawal times for cultured species and lack proper government approval and/or international recognition. Concern ranges from consumption of any drug residuals in cultured products to potential generation of antibiotic-resistant bacteria. Likewise, food ingredients that are used intentionally such as color additives, flavourings, and medication, or those which occur unintentionally, such as heavy metals, mycotoxins, toxic chemicals, and potential microbial pathogens must be legal to the intended use and comply with national and international guidelines (Otwell, 1989). Worldwide, regulatory response for drug and feed use lags behind aquaculture development. At the international level, these chemicals are classified within the group of food additives and contaminants by the joint FAO/WAO Expert Committee on Food Additives (JESFA). (Srisomboon & Poomchatra, 1995).

## QUALITY ASPECTS OF AQUACULTURE PRODUCTS

In the past, consumers have equated quality of fish and fishery products with a product exhibiting few undesirable flavour attributes, primarily the lack of strong fishy and spoilage odours. To a lesser extent, did the consumer consider the desirable flavour attributes of the fish itself. Today, flavour quality is becoming important to consumers with their increased experience and sophistication in seafood consumption (Johnsen, 1989).

Aquaculture now brings a variety of high-quality fishery products to the market place throughout the year. Because production, processing and distribution of cultured products are under greater control than captured items, the opportunity for increased control of quality, and particularly of flavour quality is now possible. Therefore farmed fish is so fresh that some existing handling procedures must be modified to take full advantage of the opportunities to develop a range of an increased supply of quality fish in prime condition.

Flavour quality of cultured fish products can be controlled to a greater extent: genetics, feed and environment can be manipulated, and attempts are now being made to take the best benefit from this knowledge. To many, the success of the industry roots on the consumers perception of the product quality. The advantages of aquaculture raised fish in producing safe and better quality fish products should be emphasized in a consumer education programme. Aquaculturists anticipate increasing prices which should provide favourable margins to offset previously prohibitive production costs. Although encouraged by these trends, many in the aquaculture industry did not anticipate the degree of product scrutiny that accompanies increasing demand. Consumers seem wiling to pay higher prices for these products, and they expect better product quality and safety. (Otwell, 1989, NMFS, 1994).

## SOCIO-ECONOMIC ASPECTS

Can aquaculture offer additional production value and employment without environmental degradation? This question is debated worldwide with confusion for jurisdictions of authority and competition for new budgets. The initial reactions are enthusiastic as evident from budget allocations to encourage developments, but the realities of environmental and resources constraints sober the situation. Thus governments' regulatory concerns are often perceived as a list of aquacultural constraints. Aquaculture activities are far more complicated to regulate than customary land-based agriculture. The resolutions lie in cooperation among all agencies, a rather difficult goal to achieve almost everywhere. Regulatory responses will require amendments and adjustments to accommodate the potential values without compromising environments, resources and consumer expectations (Otwell, 1989).

## PREVENTING SPREAD OF AQUATIC ANIMAL DISEASES

The Office International des Epizooties (OIE) has recently prepared an OIE "International Aquatic Animal Health Code". The principal aim of the "Code" and the companion "Diagnostic Manual for Aquatic Animal disease" is to harmonize health guarantees for international trade in aquatic animals and products, and to guide veterinary administrators and/or other competent authorities in the preparation of appropriate health certificates. The listed diseases in the Code are those recognized as serious transmissible diseases and for which international trade of aquatic animals and their products poses a significant risk of disease transfer between countries (Håstein, 1995).

Twenty years ago the International Council for the Exploration of the Seas (ICES), through its "Working Group on the Introduction and Transfer of Marine Organisms", formulated the first version of what is now known as the "1994 Code of Practice on the Introductions and Transfer of Marine Organisms". A similar code was adopted by the European Inland Fisheries Advisory Commission (EIFAC) of FAO/UN in the 1980's. The "success" of the codes as well as the practical difficulties of achieving their goals in many developing countries, the generally limited knowledge of the existence of these codes (other than among specialists in the field), and how to improve upon this situation, were recently discussed by Carlton (1995).

With the completion of the internal market in 1992, the Member States of the European Community undertook to create a fully unified internal market without internal borders, with free movement of goods. It is in this general context that a number of Directives have been adopted on the animal health conditions for the production and placing on the market of aquaculture animals and their products, and on the rules for the control of fish diseases. EU Member States are obliged to comply with these Directives. Based on the above Directives, a number of decisions have been taken. Most of these decisions concern the designation of approved zones or farms in the Community, free of List II diseases (those having a serious economic impact); the approval of national programmes aiming at obtaining the approved status in the near future; the sampling schemes and diagnostic procedures to be applied for obtaining and maintaining the approved status (EEC, 1990; Daelman, 1995).

## CONCLUSIONS AND RECOMMENDATIONS

Aquaculture is a large international business worth billions of dollars every year. Aquacultural developments should continue to expand and become a more prominent source of fish and fishery products by the beginning of the next century. Like traditionally caught fish, aquacultured products are perishable and require the same basic handling and processing schemes to prepare them for entry into marketing channels. However, despite these similarities, aquaculturists want to distance their practice and products from the traditional fish and fishery products setting and image. Their distinction is based on controlled production for better product quality (Shaw,

1993). This favourable attribute can offer some distinct market advantages, but as for all fish and fishery products, aquacultured products must comply with established guidelines, and regulations are generally the same, with very few exceptions, such as the specific Directives proposed by the European Community for aquaculture animals and products and the FAO Code of Hygiene Practices for Aquaculture Products and the O.I.E. International Aquatic Animal Health Code.

Concerning fish as food, regulatory initiatives will concentrate at national and international levels on problems related to consumer's safety (residuous of veterinary drugs and pesticides, new microbial concerns), product quality standards and product identification, aquatic animal helath (control of the spread of fish diseases) and socio-economic issues (aquaculture vs. environment degradation, aquaculture vs. tourism, etc.).

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