ISSN 1020-5292

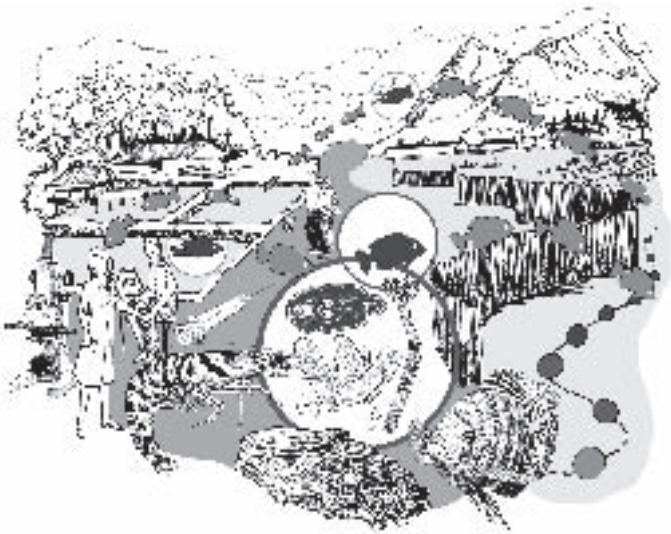
FAO TECHNICAL GUIDELINES FOR RESPONSIBLE FISHERIES

5

Suppl. 2

AQUACULTURE DEVELOPMENT

2. HEALTH MANAGEMENT FOR RESPONSIBLE MOVEMENT OF LIVE AQUATIC ANIMALS



FAO TECHNICAL GUIDELINES FOR RESPONSIBLE FISHERIES

5

Suppl. 2

AQUACULTURE DEVELOPMENT

2. HEALTH MANAGEMENT FOR RESPONSIBLE MOVEMENT OF LIVE AQUATIC ANIMALS

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2007

ISBN 978-92-5-105711-7

PREPARATION OF THIS DOCUMENT

These Technical Guidelines have been prepared by the Fisheries and Aquaculture Department of the Food and Agriculture Organization of the United Nations (FAO) under the coordination of Rohana P. Subasinghe (Senior Fishery Resources Officer [Aquaculture]), with the support of FishCode, FAO's Programme of Global Partnerships for Responsible Fisheries. The first drafts were written by J. Richard Arthur (consultant), with the assistance of R.P. Subasinghe and Melba G. Bondad-Reantaso (Fishery Resources Officer), taking into consideration the outputs of the recent *FAO Expert Workshop for the Preparation of Code of Conduct for Responsible Fisheries (CCRF) Technical Guidelines on Health Management for Responsible Movement of Live Aquatic Organisms to Reduce the Risk of Spread of Infectious Aquatic Animal Diseases*, held from 1 to 4 November 2005 in Dambulla, Sri Lanka (Dambulla Workshop). The joint Technical Secretaries of the Workshop, Sharon E. McGladdery (Department of Fisheries and Oceans – DFO, Canada) and Barry J. Hill (Centre for Environment, Fisheries and Aquaculture Science – CEFAS, United Kingdom of Great Britain and Northern Ireland, and Vice-President, World Organisation for Animal Health (OIE) Aquatic Animal Health Standards Commission), also provided valuable technical assistance in finalizing the document.

These guidelines are intended to provide general advice in support of the implementation of the FAO Code of Conduct for Responsible Fisheries (CCRF – the Code) and thus have no formal legal status. Although the Code does not directly address issues related to the safe movement of live aquatic animals and the need to reduce the risks posed by transboundary aquatic animal diseases (TAADs), the need for such guidance is recognized, *inter alia*, throughout the various sections of the Code, which strongly emphasize the need for responsible fisheries and aquaculture development, international trade, and the protection of the natural environment and aquatic biodiversity. The information presented is meant to assist with consideration of issues related to the implementation of the provisions of the Code. Furthermore, any differences in the terminology employed should not be considered as a reinterpretation of the Code. These guidelines are intended to be flexible and capable of evolving as circumstances change or as new information becomes available. They will be supported by the preparation of a companion document, *Compliance to FAO Technical Guidelines for Responsible Fisheries: Health management for responsible movement of live aquatic animals*, which will provide more detailed

documentation to assist countries and individuals in promoting health management for the safe movement of live aquatic animals.

The participants of the Dambulla Workshop are commended for their valuable technical advice and guidance, and contributions by the Government of Norway through the multilateral FishCode Trust (MTF/GLO/125/MUL) are gratefully acknowledged.

FAO. 2007. *Aquaculture development. 2. Health management for responsible movement of live aquatic animals.* FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 2. Rome, FAO. 2007. 31p.

ABSTRACT

These Technical Guidelines on *Health management for responsible movement of live aquatic animals* have been developed to support sections of FAO's Code of Conduct for Responsible Fisheries (CCRF) addressing responsible fisheries management (Article 7), aquaculture development (Article 9), international trade (Article 11) and fisheries research (Article 12). The objective of these guidelines is to assist countries in reducing the risk of introduction and spread of serious transboundary aquatic animal diseases (TAADs). Although they deal primarily with safe transboundary movement at the international level, they are also applicable to domestic movements between different provinces, geographical areas or zones of differing disease status. These Technical Guidelines also include guidance for health management at the farm and farm-cluster level, to the extent that these local production units are involved in the spread of TAADs.

CONTENTS

Page

ABBREVIATIONS/ACRONYMS

AAPQIS	Aquatic Animal Pathogen and Quarantine Information System
ALOP	Appropriate level of protection
ALOR	Acceptable level of risk
APEC	Asia-Pacific Economic Cooperation
BMPs	Better management practices
CBD	Convention on Biodiversity
CCRF	Code of Conduct for Responsible Fisheries
COFI	Committee on Fisheries
EIFAC	European Inland Fisheries Advisory Commission
FAO	Food and Agriculture Organization of the United Nations
HH	High health
ICES	International Council for the Exploration of the Sea
NACA	Network of Aquaculture Centres in Asia-Pacific
NGOs	Non-governmental organizations
OIE	World Organisation for Animal Health (formerly: International Office of Epizootics)
SPF	Specific pathogen free
SPR	Specific pathogen resistant
SPS Agreement	Agreement on the Application of Sanitary and Phytosanitary Measures
TAADs	Transboundary aquatic animal diseases
UNCLOS	United Nations Convention on the Law of the Sea
WTO	World Trade Organization

BACKGROUND

From ancient times, fishing has been a major source of food for humanity and a provider of employment and economic benefits to those engaged in this activity. However, with increased knowledge and the dynamic development of fisheries, it was realized that living aquatic resources, although renewable, are not infinite and need to be properly managed, if their contribution to the nutritional, economic and social well-being of the growing world's population was to be sustained.

The adoption in 1982 of the United Nations Convention on the Law of the Sea provided a new framework for the better management of marine resources. The new legal regime of the oceans gave coastal States rights and responsibilities for the management and use of fishery resources within the areas of their national jurisdiction, which embrace some 90 percent of the world's marine fisheries.

In recent years, world fisheries have become a dynamically developing sector of the food industry, and many States have striven to take advantage of their new opportunities by investing in modern fishing fleets and processing factories in response to growing international demand for fish and fishery products. It became clear, however, that many fisheries resources could not sustain an often uncontrolled increase of exploitation.

Clear signs of over-exploitation of important fish stocks, modifications of ecosystems, significant economic losses, and international conflicts on management and fish trade threatened the long-term sustainability of fisheries and the contribution of fisheries to food supply. Therefore, the Nineteenth Session of the FAO Committee on Fisheries (COFI), held in March 1991, recommended that new approaches to fisheries management embracing conservation and environmental, as well as social and economic, considerations were urgently needed. FAO was asked to develop the concept of responsible fisheries and elaborate a Code of Conduct to foster its application.

Subsequently, the Government of Mexico, in collaboration with FAO, organized an International Conference on Responsible Fishing in Cancún in May 1992. The Declaration of Cancún endorsed at that Conference was brought to the attention of the UNCED Summit in Rio de Janeiro, Brazil, in June 1992, which supported the preparation of a Code of Conduct for Responsible Fisheries. The FAO Technical Consultation on High Seas

Fishing, held in September 1992, further recommended the elaboration of a Code to address the issues regarding high seas fisheries.

The One Hundred and Second Session of the FAO Council, held in November 1992, discussed the elaboration of the Code, recommending that priority be given to high seas issues and requested that proposals for the Code be presented to the 1993 session of the Committee on Fisheries.

The Twentieth Session of COFI, held in March 1993, examined in general the proposed framework and content for such a Code, including the elaboration of guidelines, and endorsed a time frame for the further elaboration of the Code. It also requested FAO to prepare, on a "fast track" basis, as part of the Code, proposals to prevent reflagging of fishing vessels which affect conservation and management measures on the high seas. This resulted in the FAO Conference, at its Twenty-seventh Session in November 1993, adopting the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, which, according to FAO Conference Resolution 15/93, forms an integral part of the Code.

The Code was formulated so as to be interpreted and applied in conformity with the relevant rules of international law, as reflected in the United Nations Convention on the Law of the Sea, 1982, as well as with the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, 1995, and in the light of, *inter alia*, the 1992 Declaration of Cancún and the 1992 Rio Declaration on Environment and Development, in particular Chapter 17 of Agenda 21.

The development of the Code was carried out by FAO in consultation and collaboration with relevant United Nations Agencies and other international organizations, including non-governmental organizations.

The Code of Conduct consists of five introductory articles: Nature and Scope; Objectives; Relationship with Other International Instruments; Implementation, Monitoring and Updating and Special Requirements of Developing Countries. These introductory articles are followed by an article on General Principles, which precedes the six thematic articles on Fisheries Management, Fishing Operations, Aquaculture Development, Integration of Fisheries into Coastal Area Management, Post-Harvest Practices and Trade, and Fisheries Research. As already mentioned, the

Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas forms an integral part of the Code.

The Code is voluntary. However, certain parts of it are based on relevant rules of international law, as reflected in the United Nations Convention on the Law of the Sea of 10 December 1982. The Code also contains provisions that may be or have already been given binding effect by means of other obligatory legal instruments amongst the Parties, such as the Agreement to Promote Compliance with Conservation and Management Measures by Fishing Vessels on the High Seas, 1993.

The Twenty-eighth Session of the Conference in Resolution 4/95 adopted the Code of Conduct for Responsible Fisheries on 31 October 1995. The same Resolution requested FAO *inter alia* to elaborate appropriate technical guidelines in support of the implementation of the Code in collaboration with members and interested relevant organizations.

1 INTRODUCTION

These Technical Guidelines on *Health management for responsible movement of live aquatic animals* are developed to support sections of the Code addressing responsible fisheries management (Article 7), aquaculture development (Article 9), international trade (Article 11) and fisheries research (Article 12).

1.1 Statement of purpose

The increasing globalization and trade volume of the aquaculture sector has created many new market opportunities for farmed aquatic animals, but has simultaneously facilitated new mechanisms by which their pathogens and diseases may be spread to new areas. Problems relating to aquatic animal health may arise quickly in any country's aquaculture or fishery sector, often with serious socio-economic and ecological consequences; thus the pathogen and disease risks associated with the transboundary movements of live aquatic animals have greatly increased.

These Technical Guidelines on *Health management for responsible movement of live aquatic animals* have been prepared by the Fisheries Department of FAO in support of the *Code of Conduct for Responsible Fisheries* (FAO, 1995). Their objective is to assist countries in reducing the risk of introduction and spread of serious transboundary aquatic animal diseases (TAADs) via the international and domestic movement of live aquatic animals.

1.2 Structure and content of this document

This document is the fifteenth in the series *FAO Technical Guidelines for Responsible Fisheries* (see, for example FAO 1996, 1997) and is thus structured similarly to previously published issues of this series. The Technical Guidelines present guidance on health management for live aquatic animals to minimize the risk of introducing serious aquatic animal diseases to new areas. Although they deal primarily with safe transboundary movement at the international level, they are also applicable to domestic movements between different provinces, geographical areas or zones of differing disease status. The Technical Guidelines also include guidance for health management at the farm and farm-cluster level, to the extent that these local production units are involved in the spread of TAADs.

1.3 Guiding principles

The following Guiding Principles form the basis for this document:

1. Movement of living aquatic animals within and across national boundaries (transboundary movement) is important for economic, social, development and public resource purposes. The benefits of such movements must be weighed against the potential risks, and authorities should implement informed decisions.

2. Transboundary movements may lead to the introduction of known, new and emerging pathogens and to subsequent disease establishment and therefore, could pose risks to the animal, plant and human health status of the recipient area, including risks to existing fishing and aquaculture industries.

3. Health management, in the context of transboundary movement, encompasses all activities related to the preparation, transportation and receiving of aquatic animals that are moved between regions, countries or territories. Collaboration among all stakeholders including governments, public institutions and the private sector, including existing aquaculture and fishing industries, is important to achieve effective health management.

4. The role of health management in the context of transboundary movement is to reduce the risks arising from the potential entry, establishment or spread of pathogens and the diseases they cause. This is necessary to protect living aquatic resources, the natural aquatic environment and the aquatic biodiversity of the receiving and neighbouring regions, countries or territories. Exporting, transhipping and importing countries have continuing ethical responsibilities to ensure the safe movement of live aquatic animals.

5. Consistent with the World Trade Organization (WTO) and the *Agreement on the application of sanitary and phytosanitary measures* (SPS Agreement), all countries reserve the right to take sanitary and phytosanitary measures necessary for the protection of human, animal, or plant life. In determining the appropriate level of protection (ALOP), relevant economic, social and ecological factors have to be taken into account.

6. Countries may introduce or maintain sanitary measures resulting in a higher level of protection than would be achieved by measures based on the

relevant international standards, guidelines or recommendations (e.g. the *Aquatic animal health code* – OIE, 2005 – OIE codes are regularly updated and the latest version available at the time of these guidelines are printed is 2005); however, such measures must be justifiable based on science (i.e. risk analysis) and be consistent with the country's ALOP. Control measures applied to movements of aquatic animals within the country must also be consistent with this ALOP.

7. Countries should develop and formalize national aquatic animal health strategies and health management procedures. Such strategies and procedures should adhere to international and regional standards and be harmonized on as wide a basis as possible. Such harmonization is especially important for countries within a region, particularly those sharing transboundary waterways.

8. Countries should encourage industries to use preventative measures to limit their exposure to pathogens and disease. Such measures include but are not limited to the use of better management practices (BMPs), health certification, specific pathogen free (SPF) and high health (HH) stocks, quarantine, and vaccination protocols.

9. Health management measures in transboundary movements should be effective, practical, cost-effective and utilise readily available resources. These resources should allow the development of appropriate national and regional policies and regulatory frameworks as required to reducing the risks posed by transboundary aquatic animal diseases (TAADs).

10. Access to relevant regional and national aquatic animal health capacity (infrastructure and specialized expertise) is crucial for health management within the context of transboundary movement of aquatic animals. International organizations should give full recognition to the special circumstances and varying capacities of different countries. All countries should endeavour to develop aquatic animal health programs achieving at least minimum standards within their available resources.

11. Developed countries should assist developing country trading partners to meet international standards with regards to the health status of exported live aquatic animals. Trading partners and neighbouring countries should closely cooperate to control TAADs through the rapid sharing of information on national disease status, new disease occurrences, and the spread of existing diseases to new areas, especially via shared waterways.

12. Individual countries may need to adapt, modify or vary these Technical Guidelines to suit their particular situations and resources, while maintaining the spirit of these principles.

1.4 Definitions

Aquatic animals – All life stages (including eggs and gametes) of fish, molluscs and crustaceans originating from aquaculture establishments or removed from the wild, for farming purposes, for release into the aquatic environment or for human consumption (modified from OIE, 2005).

Biosecurity – The sum total of a country's activities and measures taken to protect its natural aquatic resources, capture fisheries, aquaculture and biodiversity and the people who depend on them from the possible negative impacts resulting from the introduction and spread of serious transboundary aquatic animal diseases (TAADs).

Competent authority – The National Veterinary Services, or other Authority of an OIE Member Country, having the responsibility and competence for ensuring or supervising the implementation of the aquatic animal health measures recommended in the World Organisation for Animal Health's (OIE) *Aquatic animal health code* (modified from OIE, 2005).

Contingency plan – A documented work plan designed to ensure that all needed actions, requirements and resources are provided in order to eradicate or bring under control outbreaks of specified diseases of aquatic animals (modified from OIE, 2005).

Disease – Clinical or non-clinical infection with an etiological agent (modified from OIE, 2005).

Health certificate – A certificate issued by an exporting country's competent authority attesting to the health status of a shipment of aquatic animals (also see International aquatic animal health certificate).

High health (HH) – Aquatic animals originating from a production facility having specific pathogen free (SPF) status, but which are now held in commercial facilities under less rigorous biosecurity conditions and thus a lower guarantee of health status. Once animals leave a HH production facility, they are no longer considered to have high health status.

International aquatic animal health certificate – A certificate issued by a member of the personnel of the competent authority of the exporting country certifying the state of health of the aquatic animals, and a declaration that the aquatic animals originate from a source subjected to official health surveillance according to the procedures described in the OIE *Manual of diagnostics tests for aquatic animals* (OIE, 2003 – OIE manuals are regularly updated and the latest version available at the time of these guidelines are printed is 2003) (modified from OIE, 2005).

Introduction – The human-assisted movement of an aquatic animal to an area outside its natural range.

Monitoring – Collection and analysis of information necessary to detect changes in prevalence or intensity of infection.

Movement – Human-mediated movement of aquatic animals within or across political borders (international, state/provincial or regional boundaries) or between differing geographic areas (e.g. between drainage basins) or zones of differing disease status.

Pathogen – An infectious agent capable of causing disease.

Precautionary approach – As pertaining to the safe movement of live aquatic animals, the obligation that, in instances where countries must make decisions in the face of incomplete knowledge, that both importing and exporting countries act responsibly and conservatively to avoid the spread of serious pathogens.

Quarantine – Maintaining a group of aquatic animals in isolation with no direct or indirect contact with other aquatic animals, in order to undergo observation for a specified length of time and, if appropriate, testing and treatment, including proper treatment of the effluent waters (modified from OIE, 2005).

Risk – The likelihood of the occurrence and the likely magnitude of the consequences of an adverse event to public, aquatic animal or terrestrial animal health in the importing country during a specified time period (modified from OIE, 2005).

Risk analysis – The complete process composed of hazard identification, risk assessment, risk management and risk communication (modified from OIE, 2005).

Risk assessment – The evaluation of the likelihood and the biological and economic consequences of entry, establishment or spread of a hazard within the territory of an importing country (modified from OIE, 2005).

Specific pathogen free (SPF) – Aquatic animals that have been produced and are tested and held under rigorous conditions of biosecurity that provide assurances that they are free of certain specified pathogens. Once animals leave an SPF facility, they are no longer considered to have SPF status.

Specific pathogen resistant (SPR) – A stock of aquatic animals that has been bred to have genetic resistance to or improved tolerance of infection by a specific pathogen.

Surveillance – A systematic series of investigations of a given population of aquatic animals to detect the occurrence of disease for control purposes, which may involve testing samples of a population (modified from OIE 2005).

Transboundary aquatic animal diseases (TAADs) – Aquatic animal diseases that are highly contagious or transmissible, with the potential for very rapid spread irrespective of national borders that cause serious socio-economic and possibly public health consequences.

Transfer – The movement of an aquatic animal to an area within the established or historical range of the species.

Zone – A portion of one or more countries comprising (a) an entire water catchment from the source of a waterway to the estuary or lake, or (b) more than one water catchment, or (c) part of a water catchment from the source of a waterway to a barrier that prevents the introduction of a specific disease or diseases, or (d) part of a coastal area with a precise geographical delimitation, or (e) an estuary with a precise geographical delimitation, that consists of a contiguous hydrological system with a distinct health status with respect to a specific disease or diseases for which required surveillance and control measures are applied and basic biosecurity conditions are met for the purpose of international trade. All areas of the zone much have the same health status. The zones must be clearly documented (e.g. by a map or other precise locators such as Geographical Positioning System [GPS] coordinated by the competent authority [ies] (modified from OIE, 2005).

Zoning – Identifying zones for disease control purposes (modified from OIE, 2005).

2 APPLICATION OF THE CODE OF CONDUCT FOR RESPONSIBLE FISHERIES TO THE SAFE MOVEMENT OF LIVE AQUATIC ANIMALS

The Code of Conduct for Responsible Fisheries (FAO, 1995) does not directly address the need to prevent the spread of transboundary aquatic animal diseases (TAADS); however, *inter alia*, disease prevention is a significant component of all of the areas addressed by the articles of the Code listed below.

2.1 Article 7 – Fisheries management

While Article 7 does not specifically address aquatic animal pathogens or diseases or their potential impacts on wild fishery resources, several subsections dealing with protecting biodiversity and the natural environment, *inter alia*, relate to this concern:

7.2.1 Recognizing that long-term sustainable use of fisheries resources is the overriding objective of conservation and management, States and subregional or regional fisheries management organizations and arrangements should, inter alia, *adopt appropriate measures, based on the best scientific evidence available, which are designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, as qualified by relevant environmental and economic factors, including the special requirements of developing countries.*

7.2.2 Such measures should provide inter alia *that:*

d. biodiversity of aquatic habitats and ecosystems is conserved and endangered species are protected;

f. adverse environmental impacts on the resources from human activities are assessed and, where appropriate, corrected;

Additionally, Article 7 introduces the precautionary approach, a concept that is being increasingly applied to the pathogen risk analysis process, where governments must make timely decisions regarding requests to import live aquatic animals or their products in the face of insufficient knowledge.

7.5.1 States should apply the precautionary approach widely to conservation, management and exploitation of living aquatic resources in

order to protect them and preserve the aquatic environment. The absence of adequate scientific information should not be used as a reason for postponing or failing to take conservation and management measures.

2.2 Article 9 – Aquaculture development

Responsible movement of live aquatic animals for aquaculture purposes, including minimizing associated risks due to transboundary diseases and the introduction of exotic species to develop new industries, is encompassed, *inter alia*, in Article 9, which deals with the responsible development of aquaculture, and in particular, in Section 9.1 and its subsections:

9.1 Responsible development of aquaculture, including culture-based fisheries, in areas under national jurisdiction

9.1.1 States should establish, maintain and develop an appropriate legal and administrative framework which facilitates the development of responsible aquaculture.

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 the best available scientific information.

9.1.3 States should produce and regularly update aquaculture development strategies and plans, as required, to ensure that aquaculture development is ecologically sustainable and to allow the rational use of resources shared by aquaculture and other activities.

9.1.4 States should ensure that the livelihoods of local communities, and their access to fishing grounds, are not negatively affected by aquaculture developments.

9.1.5 States should establish effective procedures specific to aquaculture to undertake appropriate environmental assessment and monitoring with the aim of minimizing adverse ecological changes and related economic and social consequences resulting from water extraction, land use, discharge of effluents, use of drugs and chemicals, and other aquaculture activities.

Concerns related to the aquaculture, and *inter alia*, the potential for exotic pathogens and diseases to spread widely to new areas via their introduction into shared waterways, are expressed within Section 9.2 of the Code:

9.2.1 States should protect transboundary aquatic ecosystems by supporting responsible aquaculture practices within their national jurisdiction and by cooperation in the promotion of sustainable aquaculture practices.

9.2.2 States should, with due respect to their neighbouring States, and in accordance with international law, ensure responsible choice of species, siting and management of aquaculture activities which could affect transboundary aquatic ecosystems.

9.2.3 States should consult with their neighbouring States, as appropriate, before introducing non-indigenous species into transboundary aquatic ecosystems.

At the farm and farm-cluster level, concerns related to preventing the introduction and spread of pathogens and disease are expressed in the following subsections of Section 9.4, which deals with responsible aquaculture at the production level:

9.4.2 States should promote active participation of fish farmers and their communities in the development of responsible aquaculture management practices.

9.4.4 States should promote effective farm and fish health management practices favouring hygienic measures and vaccines. Safe, effective and minimal use of therapeutants, hormones and drugs, antibiotics and other disease control chemicals should be ensured.

9.4.6 States should require that the disposal of wastes such as offal, sludge, dead or diseased fish, excess veterinary drugs and other hazardous chemical inputs does not constitute a hazard to human health and the environment.

2.3 Article 11 – Post-harvest and trade

The requirement that international trade in live aquatic animals be conducted, including, *inter alia*, ways to address concerns related to the risks due to transboundary aquatic animal diseases, following the procedures set down by the World Trade Organization (WTO) and in

particular, its Sanitary and Phytosanitary Agreement (WTO, 1994), are clearly stated in Section 11.2 dealing with responsible international trade:

11.2.4 Fish trade measures adopted by States to protect human or animal life or health, the interests of consumers or the environment, should not be discriminatory and should be in accordance with internationally agreed trade rules, in particular the principles, rights and obligations established in the Agreement on the Application of Sanitary and Phytosanitary Measures and the Agreement on Technical Barriers to Trade of the WTO.

2.4 Article 12 – Fisheries research

The need for applied fisheries research, and *inter alia*, research on serious pathogens of aquatic animals, is stated in Article 12:

12.1 States should recognize that responsible fisheries requires the availability of a sound scientific basis to assist fisheries managers and other interested parties in making decisions. Therefore, States should ensure that appropriate research is conducted into all aspects of fisheries including biology, ecology, technology, environmental science, economics, social science, aquaculture and nutritional science. States should ensure the availability of research facilities and provide appropriate training, staffing and institution building to conduct the research, taking into account the special needs of developing countries.

3 GUIDANCE FOR THE DEVELOPMENT OF AQUATIC ANIMAL HEALTH PROGRAMMES

3.1 Introduction

National and international aquatic animal health programs are essential to assure the sustainable development of aquaculture and to protect existing capture fisheries, aquaculture and aquatic biodiversity from the negative impacts of exotic pathogens and disease (see FAO/NACA, 2000, 2001; FAO, in prep.). To achieve effective national biosecurity, such national programs should include the development national, subnational and local (on-farm) components.

To achieve maximum effectiveness, national aquatic animal health programme should be harmonized, as far as possible, on an international and regional basis, and in particular, with the programme of neighbouring countries and major trading partners.

Countries are encouraged to formalize their national aquatic animal health programs through preparation of national aquatic animal health strategies developed through extensive stakeholder consultation.

3.2 Instruments and compliance

As members and/or signatories, countries should fully comply with the provisions of relevant international agreements and memberships related to the safe movement of live aquatic animals. Foremost among these are the World Trade Organization (WTO) and the *Agreement on the application of sanitary and phytosanitary measures* (SPS Agreement) (WTO, 1994), the OIE's *Aquatic animal health code* (OIE, 2005) and *Manual of diagnostics tests for aquatic animals* (OIE, 2003), and the Convention on Biological Diversity (CBD, 1992).

All transboundary movements of aquatic animals should be conducted within the provisions given in these and other relevant international and regional agreements.

4 NATIONAL STRATEGIES ON AQUATIC ANIMAL HEALTH AND BIOSECURITY

4.1 Introduction

A formalized national aquatic animal health strategy provides countries with a "road map", using the concept of phased implementation based on national needs and priorities, for achieving the desired aquatic animal health status. Guidance for the development of national strategies has been provided by FAO/NACA (2000, 2001) through the *Asia Regional Technical Guidelines on Health Management for the Responsible Movement of Live Aquatic Animals and the Beijing Consensus and Implementation Strategy*. The components of a national strategy, including biosecurity concerns, as outlined in these documents, include: pathogens to be considered, disease diagnosis, health certification and quarantine measures, disease zoning, disease surveillance and reporting, contingency planning, import risk analysis, policy frameworks and regional capacity building. To support these activities, various manuals and guidance have been published on: disease diagnosis (Walker and Subasinghe, 2000; Bondad-Reantaso *et al.*, 2001), risk analysis (APEC, 2004), surveillance and zoning (Subasinghe, McGladdery and Hill, 2004) and emergency preparedness (Arthur *et al.*, 2005). Additionally, the NACA/FAO, *Quarterly aquatic animal disease reporting system (Asia and Pacific)* (see NACA/FAO, 1999–2006) has been established to facilitate regional reporting of serious aquatic animal diseases. This is supported by the Web-based aquatic animal disease databases such as the *Aquatic animal pathogen and quarantine information system* (AAPQIS) (http://www.aapqis.org), which was established to provide aquatic animal health professionals with information on serious transboundary aquatic animal diseases.

4.2 Policy, legislation and enforcement

Countries should develop a clear formalized national policy for aquatic animal health management, including policy to deal effectively with TAADs (see FAO/NACA, 2000, 2001; FAO, in prep.).

Such policy should be implemented through effective national legislation. Adequate capability to enforce laws and regulations must be established.

4.3 Risk analysis

Countries are encouraged to use risk analysis procedures as the basis for assessing requests to import living aquatic animals (see FAO/NACA, 2000,

2001; APEC, 2004; OIE, 2005; FAO, in prep.). Consistent with the World Trade Organization (WTO) and the *Agreement on the application of sanitary and phytosanitary measures* (SPS Agreement) (WTO, 1994), countries choosing to adopt a higher level of protection than that provided by international standards should use risk analysis as the basis for providing scientific justification for such measures.

In conducting risk analyses, an importing country may need to evaluate the capabilities of the competent authority of the exporting country and the effectiveness of any disease surveillance, monitoring or zoning systems in place.

The varying risk analysis capacities of originating, transhipping and receiving countries should be recognized and all countries should work together to minimize risks of transboundary movements of live aquatic animals.

In determining their appropriate level of protection (ALOP) in respect to potential risks to human, animal, or plant life due to transboundary aquatic animal diseases (TAADs), countries should take into consideration relevant economic, social and ecological factors, including the social and economic benefits of trade and the need to protect existing aquaculture, capture fisheries, the environment and aquatic biodiversity from the negative impacts of serious disease outbreaks. Countries should also ensure that their ALOP is consistent across trade in aquatic, terrestrial and plant commodities.

While national ALOP may be estimated from past trading practices, it may be useful for countries to discuss ALOP at the national level and to develop a formal statement of ALOP or acceptable level of risk (ALOR).

The first movement (introduction) of a new exotic aquatic species into an area often poses an unknown and potentially high level of pathogen risk, and thus such requests should be subjected to ecological, genetic and pathogen risk analyses (see ICES, 2005). Such introductions will require special stakeholder consultations, including all countries sharing transboundary waters, to evaluate scientific evidence regarding the risk of introducing pathogens to new areas.

In cases where insufficient knowledge exists in relation to disease risks posed by a particular movement of an aquatic animal, a precautionary approach should be adopted by the receiving country.

Countries should not apply mitigative measures (sanitary measures) in a manner that would constitute a disguised restriction on trade or commercial activity. Such measures should be applied only to the extent necessary to protect animal, plant or human life or health, and must be based on scientific principles and not be maintained without sufficient scientific evidence.

Countries should ensure that the application of mitigative measures does not arbitrarily or unjustifiably discriminate between trading partners where identical or similar conditions prevail, including between their own territory and that of their trading partner countries.

Countries should accept any alternative mitigative measures proposed by trading partners as equivalent, even if these measures differ from their own or from those used by other countries trading in the same commodity, if the exporting country objectively demonstrates that its measures achieve the importing country's ALOP.

In cases where serious disagreements arise between importing and exporting countries over the placing of restrictions on the movement of live aquatic animals, countries are encouraged to use the OIE's voluntary in-house mechanisms for settlement of disputes.

Countries should also consider using risk analysis as a tool to develop national aquatic animal health strategies, as the risk analysis approach can assist in identifying areas of major concern, allowing effective development and use of manpower, infrastructure and other resources.

4.4 Pathogen lists

Countries should establish lists of serious pathogens of national concern (see FAO/NACA, 2000, 2001; FAO, in prep.). Such lists should include those serious pathogens and diseases that are established in national territory but which have not yet spread to all geographic areas, those that are under national control and/or eradication programme, and those pathogens that are exotic but whose entry and spread are judged to pose serious risks to national aquatic resources.

National pathogen lists should include, as appropriate, those pathogens and diseases listed by the World Organisation for Animal Health (OIE, 2005), as well as other pathogens of national significance.

4.5 Information systems

Countries are encouraged to establish national aquatic animal health information systems for the collection, storage, analysis and reporting of information related to the health of aquatic animals (Baldock, 2004). Such systems should include up to date information on the pathogens and diseases occurring in national waters, including their host species and geographic distributions (see FAO/NACA, 2000, 2001; FAO, in prep.).

Countries should make such information systems accessible to trading partners and other stakeholders, and link them to similar regional and international databases.

4.6 Health certification

As appropriate, countries should develop the capacity to issue international health certificates for aquatic animals using the formats and diagnostic tests as specified by the OIE's *Aquatic animal health code* and *Manual of diagnostic tests for aquatic animals* (OIE, 2003, 2005). The use of certificates purporting freedom from disease based on absence of clinical signs or on the general "healthiness" of shipments of aquatic animals should be strongly discouraged.

Where appropriate, importing countries should demand that shipments of live aquatic animals be accompanied by international health certificates. The certification requirements should be exact and concise, and should clearly convey the information required by the importing country (OIE, 2005).

The specific pathogens to be certified should be specified based on such factors as the species being imported, the disease status of the exporting, transshipping and importing countries, and the national level of protection of the importing country.

Requests for certification of freedom from pathogens or diseases not officially listed by the OIE should be based on mutual agreement between importing and exporting countries or on a risk analysis, which should be made available to trading partners. Importing countries should not request certification for pathogens that are not appropriate to the commodity, source or their national disease situation.

Exporting, transshipping and importing countries should cooperate fully, in a transparent and timely matter, with regard to exchange of information on certification requirements and their national aquatic animal health situation, the health history and current health status of the production facility and/or shipment of aquatic animals destined for importation and other related matters (see OIE, 2005).

In assessing the reliability of health certificates, an importing country may need to evaluate the diagnostic expertise and capabilities of the competent authority of the exporting country and the effectiveness of any disease surveillance, monitoring or zoning systems in place.

4.7 Quarantine

Where risk analysis has shown that the level of risk posed by the proposed importation of a shipment of live aquatic animals is unacceptable, quarantine is one of a number of potential risk mitigation measures that singly or in combination with other measures, can be considered to reduce the risk to within the national ALOP (see FAO/NACA, 2000, 2001; FAO, in prep.).

The stringency of quarantine applied should be commensurate with the estimated level of risk, which is a function of the source and destination of the aquatic animal movement. Importations of exotic species for aquaculture development and those originating from wild populations or other sources of unknown or poorly documented health status will often require stringent quarantine measures. For the first movement (introduction) of an exotic species, the use of protocols outlined by the International Council for the Exploration of the Sea (ICES, 2005) and the European Inland Fisheries Advisory Commission (EIFAC) (Turner, 1988) is strongly recommended.

Because transmission of pathogens can occur across major taxonomic groups of aquatic animals, countries should avoid making scientifically unsound, arbitrary distinctions between marine and freshwater species, or between wild, cultured or ornamental species, with respect to the risk posed and the level of quarantine needed.

Quarantine procedures, including observation for clinical signs of disease and diagnostic testing, can be conducted in the country of origin, in a country of transit and/or in the receiving country.

Quarantine containment facilities should meet minimum standards for location, design, infrastructure and equipment, physical security, treatment of intake and discharge waters, staff expertise and training, and operating protocols to ensure their effective operation and that aquatic animals and any pathogens they may carry will not escape into the surrounding environment.

Movements involving a high or unknown health risk (e.g. from areas where exotic diseases are known to occur) should only take place where full containment facilities and support services (diagnostics capability, security, inspection) are in place. Where facilities do not currently meet these requirements, only low risk movements should be approved.

Where possible, countries should reduce the level of risk involved by importing eggs, embryonic or juvenile stages, as these generally carry fewer subclinical infections than do adult animals and are often easier than adults to maintain under quarantine conditions.

Candidate stocks should be transferred on a batch-by-batch basis, a batch being a group of animals of the same age, from the same population and maintained as a discrete group on the same water source. Mixing of animals, water or equipment between batches should not occur.

Co-habitation experiments in which key native species are held in contact with the exotic species or effluent waters from the quarantine holding tank can be performed to investigate pathogen presence in imported aquatic animals and the susceptibility of native species. Placing quarantined animals under increased stress may also assist in the overt expression of subclinical infections.

Many diseases, especially those caused by external parasites, can be treated. However, because chemical therapy can cause additional health complications, such as the development of antibiotic-resistant strains of bacteria, it should be used responsibly, with due caution and expert advice.

Should a serious untreatable disease or pathogen be encountered in aquatic animals held in quarantine, the entire stock should be destroyed and the facility appropriately disinfected.

Introductions from sources that have passed a quarantine containment process may receive “approval” status if conditions do not change at the export site, further reducing quarantine requirements/duration.

4.8 Disease surveillance, monitoring and reporting

As appropriate, countries should establish disease surveillance and monitoring programs to provide a systematic process for gathering information on the occurrence of important pathogens and diseases occurring within their national territory (see FAO/NACA, 2000, 2001; Subasinghe, McGladdery and Hill, 2004; FAO, in prep.; OIE, 2005). Well designed surveillance and monitoring programmes are essential to produce meaningful reports on national disease status and to support risk analysis, justify import health certification requirements and enable export health certification by providing evidence to substantiate claims of absence of a particular disease. Such programs also support the rapid implementation of national contingency plans for the containment or eradication of pathogens causing serious disease outbreaks.

Countries should support national surveillance programmes by establishing necessary diagnostics and reporting procedures, including field personnel trained in disease recognition and reporting, to ensure accurate and rapid pathogen identification.

Such data should be entered into a national database to ensure up-to-date information on national disease status and the distribution of important pathogens and diseases is readily accessible to policy-makers, the competent authority and other stakeholders.

The absence of national capacity to diagnose aquatic animal diseases or to collect data through national networks should not be seen as a hindrance to developing and maintaining national surveillance and reporting systems. Countries should prepare national summaries on a quarterly basis, to the best of their ability, while capacity for disease diagnosis and surveillance, monitoring and reporting are being developed.

Countries should promote the appropriate training of personnel and the development of standardized field and laboratory methodology, and training and reference manuals, as these will significantly increase capacity to investigate suspected disease outbreaks.

Countries should provide accurate, timely and conscientious reporting of disease notifications and associated epidemiological information (see OIE, 2005), as appropriate, to the World Organisation for Animal Health (OIE) or to other disease reporting systems (e.g. the NACA/FAO, *Quarterly*

aquatic animal disease reports (Asia and Pacific Region) (NACA/FAO, 1999–2006).

All countries should cooperate to develop regional and international consistency in surveillance and reporting, including the development of standardized data codes, recording formats, standards for laboratory diagnostic practices, geographic mapping systems, and data analysis aimed at disease control measures.

Countries should maintain clear records that permit tracing of the source of documentation and material upon which summary reports are based.

Specific indicators for monitoring should be provided, including a practical feedback mechanism to original source of disease information.

4.9 Zoning

Where a serious disease is present in part of a nation's territory and eradication is not feasible in the foreseeable future, countries should consider the possibility of zoning as a means to establish and maintain zones free of the disease and to permit international and domestic trade in live aquatic animals originating from these zones (see FAO/NACA, 2000, 2001; Subasinghe, McGladdery and Hill, 2004; FAO, in prep.; OIE, 2005).

Countries should consider establishing free zones based on ecological, geographical, hydrographical or climatological barriers (e.g. entire river systems, drainage basins and coastal areas) rather than on political boundaries.

In some cases, such non-political boundaries may encompass the territories of several countries. Countries should thus cooperate to establish and maintain free zones involving multinational river catchment areas, bays or ocean coastlines. Countries should also cooperate to initiate pilot projects and the exchange of information needed to evaluate the feasibility of zoning on a subregional basis.

Countries should follow the movement principle of zoning, in which live aquatic animals may be moved between zones where the same pathogens are present, or from zones where fewer/none of the same pathogens are present in the receiving waters. They may not be moved from zones having pathogens that are absent from the receiving zone.

Where zones are of equal health status, countries should recognize that there is little justification for prohibiting trade between them on the basis of disease risk. This applies equally to trade between zones having demonstrated freedom from a particular disease(s), and trade between zones that are positive for the same disease (infected zones).

In certain cases, e.g. where aquaculture facilities, although located in infected areas, are on ground water and do not intake water or discharge effluents into adjacent waters, establishing "mini-zones" based on individual aquaculture production facilities or farm clusters should be considered.

As appropriate, countries and their aquaculture industries should develop the high level of diagnostic, surveillance, monitoring and reporting capabilities as well as regulatory control mechanisms that are necessary to implement effective disease zoning.

In selecting diseases for zoning, countries should take into consideration the potential increased production due to absence of the pathogen versus the cost of setting up and maintaining the zoning system.

In order to demonstrate the disease-free status of zones, countries must meet the specific technical requirements outlined in the OIE's *Aquatic animal health code* (OIE, 2005).

Countries should consider the establishment of surveillance zones around free zones to serve as buffers to prevent the entry of specific pathogens into a free zone and as a means to expand the free zones. In order to establish and maintain surveillance zones, countries must meet the specific technical requirements outlined in the OIE's *Aquatic animal health code* (OIE, 2005).

As zoning can be a highly effective means to restrict the spread of important pathogens of aquatic animals and aid in their eradication, countries and subregions should consider the general principles of zoning when preparing disease contingency plans.

Although countries may not be able to meet all the provisions for zoning as specified by the OIE, they can apply the general principles of zoning and movement as an initial step to prevent disease spread and develop experience, capability and infrastructure for the compilation of surveillance data and the formulation of legislation.

4.10 Emergency preparedness

Countries should develop emergency planning for aquatic animal diseases as a core function of government services.

In order to respond rapidly and effectively to contain and eradicate serious disease outbreaks caused by transboundary aquatic animal diseases (TAADs) and thus minimize their social and economic impacts, countries should develop and test national contingency plans (see FAO/NACA, 2000, 2001; OIE, 2005; Arthur *et al.*, 2005, FAO, in prep.).

Achieving rapid response to disease outbreaks or the detection of a serious pathogen requires an effective level of disease surveillance, diagnostics and reporting, and countries thus need to develop adequate capacity in these areas. National reference laboratories capable of rapidly diagnosing aquatic animal diseases should be established.

To achieve effective contingency planning, countries must define all requirements and ensure that needed manpower and equipment can be deployed promptly. A clear structure for effective decision-making with clearly defined responsibilities and authority is essential. The legal provisions necessary to implement contingency plans must be in place.

Although some developing countries will not be able to implement a fully developed contingency plan, an incomplete plan is still valuable as it will allow more rapid reaction to disease outbreaks and provide a strong framework for future development. Countries should develop plans that meet their particular situations and resources.

Countries should recognize that emergency preparedness is a continuous activity and that contingency plans need to be tested and updated on a regular basis.

Countries should include planning for a “worst case” scenario in which a new, highly virulent and rapidly spreading pathogen has become established in national territory.

Effective national emergency preparedness includes involvement of the private sector as well as local, state and central government agencies, and thus in developing contingency plans countries should involve and/or consult responsible agencies and stakeholders at all levels.

Responsible agencies should consider the issue of compensation to aquaculturists for stocks that may need to be destroyed as part of disease control efforts.

When facing new or rapidly spreading disease situations, countries should recognize the need to react quickly under conditions where full information is not available. In such situations countries should adopt a cautious approach, moving rapidly to make decisions based on available information.

Neighbouring countries, and in particular, those having shared waterways, should develop and promote regional mechanisms to assure that adequate financial resources, expertise and capacity are available to deal with national disease emergencies, including the deployment of regional emergency teams to affected countries.

4.11 Research

Countries should recognize that the knowledge base for aquatic animal diseases is much less extensive than that for diseases of terrestrial animals. In many cases, knowledge of the diseases of key cultured species is still incomplete, and particularly for developing countries, information on the pathogens and parasites occurring in their national waters is lacking (see FAO/NACA, 2000, 2001; FAO, in prep.).

Countries should thus undertake, as a priority, baseline disease surveys of the pathogens of key cultured and traded species. In addition to targeted surveillance for listed diseases, it is useful to have a broad understanding of the national disease status by undertaking general surveys of the pathogens (parasites, bacteria, viruses, fungi) infecting native aquatic animal stocks and basic investigatory studies that will provide more general observational information that will support biosecurity risk assessment and management.

Countries should also fund targeted research to support key information gaps (e.g. pathways of pathogen spread, methods for inactivation of infectivity, vaccination, basic pathological studies for newly emerging diseases, identification of at-risk populations, effects of processing, storage and transport, disease mapping) identified during the risk analysis process.

Coordination and sharing of costs and research effort and results on a regional basis between trading partners and countries culturing the same species and using similar culture systems should be considered to speed research, avoid duplication of effort and reduce research costs.

4.12 Institutional structure

As appropriate, countries should develop and enact the legislation and supporting regulations necessary to support the safe international and domestic movement of live aquatic animals (see FAO/NACA, 2000, 2001; FAO, in prep.).

In developing legislation, countries should ensure that aquatic animal health legislation is harmonized with similar national and state legislation dealing with terrestrial animals and plants, general food safety and relevant national environmental and conservation acts.

Such legislation must also be in accordance with international and regional agreements and memberships, such as the World Trade Organization and the World Organisation for Animal Health.

Countries need to develop adequate institutional and laboratory infrastructure to support the safe movement of live aquatic animals. This includes inspection facilities, quarantine centers, diagnostics laboratories, field offices and laboratories, research laboratories, enforcement facilities, etc. To assist in identifying existing capacity and needs, countries may benefit from conducting national institutional assessments. Similarly, analysis of cost-benefits from investments in infrastructure and training should be considered at an early stage.

Countries should ensure that adequate foresight and planning is undertaken to ensure that physical infrastructure and technical capacity is adequate to meet national needs, while avoiding duplication of effort. Where possible, coordination with existing state and private sector veterinary laboratories, universities and research centers on both a national and regional level should be considered. Infrastructure development should be clearly matched against requirements in terms of the pathogens likely to be of importance and their potential socio-economic significance.

4.13 Human resources development

Countries should develop adequate human resources to support the safe movement of live aquatic animals. This includes skilled policy makers and senior management, researchers, quarantine officers, veterinarians, diagnosticians, risk analysts, epidemiologists, extension officers and private sector aquaculturists. Training should be clearly matched against identified national requirements and priorities.

As a major constraint to research in developing countries is a lack of skilled scientists, countries should support the advanced training of researchers in key areas related to problem solving for aquatic animal health.

Extension services and integrated networks for disease surveillance, monitoring, reporting and diagnostics are particularly important to achieving adequate emergency preparedness and thus training for these staff should be given high priority.

Countries should recognize the importance and cost effectiveness of keeping competent staff within their aquatic animal health management programs over prolonged periods, and ensure that adequate professional and financial incentives are available to retain key professionals. Retaining such experience is invaluable in maintaining a consistent health management program and in "in-house" training of junior staff.

4.14 Regional and international cooperation

Countries should recognize that there are many opportunities to increase regional and international cooperation in promoting health management for the safe movement of live aquatic animals. These include:

- developing and disseminating national and regional advisory, technical and implementation guidelines;
- harmonizing regulatory frameworks, including procedures for evaluating risk and risk management measures such as certification standards and quarantine procedures;
- developing research collaboration among government, academic, research and private sector organizations;
- establishing and supporting regional research and training centres and advanced diagnostics laboratories;
- developing regional mechanisms for emergency response to serious disease outbreaks through regional level contingency planning to assist countries requesting aid;
- exploring possibilities for subregional disease zoning; and
- communicating the benefits of cooperative and inclusive approaches to aquatic animal health management on all levels and to all parties involved in transboundary movements.

Countries should recognize that the benefits of regional and international cooperation are many and include, but are not limited to, building consensus among countries within and between regions; sharing of information on diseases and pathogens and their potential to spread; pooling scarce resources (infrastructure and expertise) and avoiding needless duplication.

Countries should promote bilateral and multilateral technical cooperation and training among aquatic animal health professionals, researchers and institutions. Such cooperation among countries of varying capacity is essential for the generation and exchange of information and expertise.

Regional and international disease monitoring and reporting systems and pathogen databases should be supported.

Countries should harmonize their national procedures for health certification, quarantine and diagnostics on a regional and international basis.

Countries having shared watersheds should recognize that any negative impacts resulting from introductions and transfers of live aquatic animals into such systems are likely to have serious consequences not only for the importing country, but also for other countries sharing the watershed. Consultation with neighbouring countries during the risk analysis process and before an introduction or transfer is approved is thus essential. The risk analysis process should take into consideration the ALOPs of all countries likely to be affected by such movements.

Regional and international organizations should provide countries involved in the transboundary movement of live aquatic animals with appropriate information, advice and guidelines so that disease risks are minimized. In addition, these organizations should assist countries to build consensus, resolve disputes, develop harmonized risk assessment approaches and implement practical national aquatic animal health management strategies to reduce the risk of introduction and spread of diseases.

5 FARM-LEVEL HEALTH MANAGEMENT AND BIOSECURITY PROGRAMMES

5.1 Introduction

Guidance presented in this section will be restricted to areas relating to the role of farms and farm clusters in preventing, controlling and eradicating serious transboundary aquatic animal diseases. More general guidance on on-farm health management issues is well-covered by other local and regional documents.

Countries should recognize the key role played by on-farm activities in preventing international spread of disease, the importance of safe movement of live aquatic animals by farmers and farmer associations, and the need for most national level activities to be also undertaken at the farm level (e.g. health monitoring, diagnosis, quarantine, reporting, communication, access to information, emergency response, etc.).

The important role that farm cluster management and better management practices (BMPs) can play in improving on-farm management, including aquatic animal health and the safe movement of live aquatic animals, has been illustrated by recent experiences. Both farm cluster management and BMPs have the advantage of being developed by direct participation of the affected aquaculturists, and thus are “bottom-up” rather than “top-down” management practices.

5.2 Cluster management

Farm cluster management has recently been shown as a successful mechanism to empower small-scale rural farmers and to improve aquaculture practices, including those related to health management for the safe movement of live aquatic animals. Farm clusters consist of farmers located in the same local area and often sharing the same water source. Cluster management thus can provide a mechanism to introduce standardized, shared and improved methods for aquatic animal health management, including diagnostics, disease control and reporting.

5.3 Better management practices

Better management practices (BMPs) are sets of guidelines and operational procedures that are produced and voluntarily agreed upon and implemented by the private sector. They are typically developed by aquaculturists

producing a similar commodity (e.g. marine shrimp, freshwater finfish) and operating in the same geographical area and under the same type of culture system. Countries should thus promote the use of BMPs as a mechanism to promote safe movement of live aquatic animals through improved disease prevention, control and reporting.

5.4 Compliance with national legislation

Farmers should be educated in the need to comply with existing national legislation, including the reasons for such legislation and the penalties and animal health risks for non-compliance. The risks to their aquaculture operations posed by TAADs entering the country via unsafe and/or illegal movements of live aquatic animals, and particularly the use of exotic species, should be emphasized.

5.5 Certification

Farmers should be made aware of the different types of health certificates, the health guarantees they provide, and their value in preventing disease and increasing production. These include:

- certification of farms and clusters as free of specific diseases (i.e. zoning);
- health certification of broodstock and fry/postlarvae (individual animals and lots) as being free from specific diseases;
- international health certificates;
- the meaning and value of specific pathogen free (SPF), specific pathogen resistant (SPR) and high health (HH) stocks; and
- the value and limitations of the diagnostics tests used to produce these certificates (e.g. molecular based testing of broodstock and juvenile stages).

5.6 On-farm disease prevention

On-farm disease prevention is a key element in assuring healthy stocks and preventing the domestic and international spread of serious pathogens.

Countries should encourage farmers to use basic health procedures, such as requesting health certificates for animals entering the premises, quarantine of new stock, appropriate treatment of intake and effluent waters,

appropriate biosecurity measures, and the appropriate use of vaccines and chemicals, particularly antibiotics.

Regular fallowing of aquaculture production facilities should be considered as part of a routine on-farm program of aquatic animal health, as this practice has been shown to break pathogen life cycles and restore local environments (see OIE, 2005).

Rapid on-farm diagnosis of disease occurrence is essential to controlling and eradicating serious diseases. Farm managers and other staff thus should be capable of conducting pond-side diagnostics to a least Level 1 (see FAO/NACA, 2000). However, experienced veterinary or other aquatic animal health services providers should be sought to investigate disease events, as well as be involved in preventative health measures.

5.7 Surveillance and reporting of disease outbreaks

For national surveillance programmes to be effective, farm-level recognition of unusual morbidity or mortality must occur, and aquaculturists thus must be made aware of the need to report such occurrences to responsible field staff of the competent authority. The necessary networks and communication linkages between farmers, extension officers and local, state and national diagnostics centers, the competent authority and national emergency preparedness teams must thus be in place.

5.8 Emergency preparedness

Farm or farm-cluster level contingency plans should be developed and tested so that aquaculturists can react quickly to stop the spread of potentially serious diseases at the farm level. Governments and farmer organizations should explore mechanisms to compensate individual farmers in cases where stock destruction is necessary.

5.9 Information sharing and farmer education

Countries should provide necessary training and information to farmers and farm clusters to provide them with the tools to recognize and report disease outbreaks. Information on serious diseases of national/regional importance should be provided in simple formats that can be disseminated by farmer organizations and extension officers.

6 PRECAUTIONARY APPROACH

In conducting a pathogen risk analysis for a proposed movement of live aquatic animals, countries should, as a primary consideration, assess the level of uncertainty inherent in the relevant knowledge base (e.g. the health status and history of the commodity and stock of origin, the disease status of the importing and exporting countries, etc.) (see APEC, 2004; OIE, 2005).

Where the information available is insufficient to permit an accurate risk estimate, countries should adopt a precautionary approach, by which both importing and exporting nations act responsibly and conservatively to avoid the spread of serious pathogens.

As appropriate, countries should apply the precautionary approach (1) through the application of "cautious interim measures" to restrict trade (e.g. temporary bans, use other sources of known health status, use of SPF stocks, surface-disinfected eggs, stringent quarantine, etc.) until a sound risk analysis can be completed; (2) during the risk assessment, when sensitivity analysis reveals key information gaps that must be addressed by targeted research; and (3) during risk management, when mitigation measures are applied to reduce risk to an acceptable level (Arthur *et al*., in press).

In applying the precautionary approach, importing countries should use the least trade restrictive methods needed to achieve the required level of temporary protection, and are obligated to move rapidly to obtain the information necessary to complete the risk analysis.

7 REFERENCES

APEC. 2004. *Manual on risk analysis for the safe movement of aquatic animals (FWG/01/2002).* By J.R. Arthur**,** M. Bondad-Reantaso, F.C. Baldock, C.J. Rodgers & B.F. Edgerton. APEC Publ. No. APEC #203-FS-03.1, 59 p., Singapore.

Arthur, J.R., Baldock, F.C., Subasinghe, R.P. & McGladdery, S.E. 2005. *Preparedness and response to aquatic animal health emergencies in Asia.* FAO Fisheries Technical Paper No. 486, 40 p., Rome.

Arthur, J.R., Baldock, C.F., Bondad-Reanaso, M.G., Perera, R., Ponia, B. & Rodgers, C.J. Pathogen risk analysis for biosecurity and the management of aquatic animal movements. *Diseases in Asian Aquaculture VI.* Fish Health Section, Asian Fisheries Society (in press).

Baldock, C. 2004. Disease surveillance. p. 37–42. *In* J.R. Arthur and M.G. Bondad-Reantaso (eds.). *Capacity and awareness building on import risk analysis for aquatic animals.* Proceedings of the Workshops held 1–6 April 2002 in Bangkok, Thailand and 12–17 August 2002 in Mazatlan, Mexico. APEC FWG 01/2002, NACA, Bangkok.

Bondad-Renataso, M.B., McGladdery, S.E., East, I. & Subasinghe, R.P. (eds). 2001. *Asia diagnostic guide to aquatic animal diseases.* FAO Fisheries Technical Paper No. 451, 73 p., Rome.

CBD. 1992. *Convention on Biological Diversity*. 5 June 1992, 29 p. (http://www.biodiv.org/convention/articles.asp)

FAO. 1995. *Code of conduct for responsible fisheries*. Food and Agriculture Organization of the United Nations, 41 p., Rome.

FAO. 1996. *Precautionary approach to capture fisheries and species introductions.* FAO Technical Guidelines for Responsible Fisheries No. 2, 54 p. Rome.

FAO. 1997. *Aquaculture development.* FAO Technical Guidelines for Responsible Fisheries No. 5, 40 p., Rome.

FAO. *Compliance to FAO Technical Guidelines for Responsible Fisheries: Aquaculture Development – Health Management for Responsible Movement of Live Aquatic Animals* (in preparation).

FAO/NACA. 2000. *The Asia regional technical guidelines on health management for the responsible movement of live aquatic animals and the Beijing consensus and implementation strategy*. FAO Fisheries Technical Paper No. 402, 53 p., Rome.

FAO/NACA. 2001. *Manual of procedures for the implementation of the Asia regional technical guidelines on health management for the responsible movement of live aquatic animals.* FAO Fisheries Technical Paper No.402, Supplement 1,106 p., Rome.

ICES. 2005. *ICES Code of practice for the introductions and transfers of marine organisms 2005.* International Council for the Exploration of the Sea, Copenhagen, 30 p.

NACA/FAO. 1999–2006. *Quarterly aquatic animal disease reports (Asia and Pacific region).* (available at: http://www.enaca.org)

OIE. 2003. *Manual of diagnostic tests for aquatic animals.* 4th Edn. Paris. (http://www.oie.int/eng/normes/fmanual/A_summry.htm)

OIE. 2005. *Aquatic animal health code*. 8th Edn. Paris. (http://www.oie.int/eng/normes/fcode/A_summry.htm)

Subasinghe, R.P., McGladdery, S.E. & Hill, B.J. (eds). 2004. *Surveillance and zoning for aquatic animal diseases.* FAO Fisheries Technical Paper No. 451, 73 p., Rome.

Turner, G.E. (ed.) 1988. *Codes of practice and manual of procedures for consideration of introductions and transfers of marine and freshwater organisms.* EIFAC Occasional Paper. No. 23, 44 p.

Walker, P. & Subasinghe, R. (eds.). 2000. *DNA-based molecular diagnostic techniques; research needs for standardization and validation of the detection of aquatic animal pathogens and diseases.* FAO Fisheries Technical Paper No. 395, 93 p., Rome.

WTO. 1994. *Agreement on the application of sanitary and phytosanitary measures*. p. 69–84. *In* The results of the Uruguay Round of multilateral trade negotiations: the legal texts. General Agreement on Tariffs and Trade (GATT), World Trade Organization, Geneva.

These technical guidelines on *Health management for responsible movement of live aquatic animals* have been developed to support sections of FAO's Code of Conduct for Responsible Fisheries addressing responsible fisheries management (Article 7), aquaculture development (Article 9), international trade (Article 11) and fisheries research (Article 12). The objective of these guidelines is to assist countries in reducing the risk of introduction and spread of serious transboundary aquatic animal diseases. Although they deal primarily with safe transboundary movement at the international level, they are also applicable to domestic movements between different provinces, geographical areas or zones of differing disease status.

ISBN 978-92-5-105711-7 ISSN 1020-5292

9 789251 057117

TC/M/A1108E/1/04.07/1800