The Role of Quarantine in Preventing the Spread of Serious Pathogens of Aquatic Animals in Southeast Asia

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Abstract

Quarantine, in the strict sense, is the confinement of aquatic animals of unknown or questionable health status in secure facilities such that neither they nor any pathogens they may be carrying can escape into the external environment. During the period of quarantine, the animals are observed, tested, and treatment may be applied, and a decision will be made as to whether or not they should be released to the external environment.

While the concept of quarantine for aquatic animals has existed for many years, within the current framework of "national biosecurity", quarantine is seen as one of a number of risk mitigation options that governments can apply to reduce the likelihood of serious pathogens being introduced with the importation of live aquatic animals and their products.

Although the concept of quarantine is relatively simple, its effective implementation may be complex, due to the need for specialized infrastructure, capability and expertise. Several Southeast Asian countries have considered or attempted to implement border quarantine for live aquatic animals; however, these efforts have met with little success. This has been due to a number of reasons, including failure to carefully define the scope and purpose of quarantine within a national aquatic animal health program, the diversity of forms in which trade occurs, the sheer volume of commodity traded, the lack of simple and accurate diagnostics tests for some pathogens, and the limited capital and human resources that governments are able to commit to this effort.

To improve this situation, risk analysis can be used to determine whether or not the importation of a given commodity (living aquatic animal or its product) poses an unacceptable disease risk to national biosecurity. In those cases where an unacceptably high level of risk exists, possible risk mitigation measures can then be examined to determine what actions, if any, can be applied to reduce the risk to within the country's appropriate level of

protection (ALOP). In this way, quarantine, as one of a suite of possible risk reduction measures, can be applied effectively on a case-by-case basis to reduce the risk of introduction, establishment and spread of serious aquatic animal pathogens into new areas.

Introduction

What is Quarantine?

Quarantine has been defined in a number of ways. The *International Aquatic Animal Health Code* of the Office International des Épizooties (OIE, the World Animal Health Organization) defines the term "quarantine" as:

> "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 effluent waters." (OIE 2003).

A similar but slightly different definition was used by the Food and Agriculture Organization of the United Nations (FAO) and the Network of Aquaculture Centres in Asia-Pacific (NACA) during the recent regional Technical Cooperation Project "Assistance for the responsible movement of live aquatic animals" (FAO/NACA TCP RAS 6714(A) and 9605(A) (FAO/NACA 2000):

> "Holding or rearing of aquatic animals under conditions which prevent their escape, and the escape of any pathogens they may be carrying, into the surrounding environment. This usually involves sterilisation/disinfection of all effluent and quarantine materials."

In contrast, in Australia, the legal basis for import biosecurity, the Quarantine Act (1908), defines "quarantine" with a wide scope, to include pre-border (e.g., health certification), border (e.g., quarantine *sensu stricto*) and post-border (e.g., monitoring and surveillance) activities. Thus the operational agency, the Australian Quarantine and Inspection Service (AQIS), uses the term "quarantine" in a very wide sense (see Bernoth 1998). Biosecurity Australia, however, generally considers the terms "biosecurity" and "quarantine" to be equivalent when quarantine is used in the sense that it has in the Quarantine Act (i.e., in the broadest sense). Thus in legal situations, Biosecurity Australia uses the word "quarantine", while in other situations "quarantine" is avoided because it is confusing to people from outside Australia, who generally consider that it means a period of mandatory detention (Peter Beers, pers. comm.). In recent Australian risk analyses for aquatic animals, the term "quarantine measures" is used in the sense that other countries use the term "quarantine."

In this paper, "quarantine" will be discussed using the concept of mandatory detention as applied by OIE and FAO/NACA.

The Purpose of Quarantine

The primary purpose of quarantine is to minimize the risk of introducing infectious agents (pathogens) into the national territory of the importing country and their escape and spread to susceptible species. The secondary purpose is to prevent the entry of aquatic organisms that have not been approved for introduction.

Attempts to Establish National Quarantine Programs in Southeast Asia

The international spread of serious pathogens of aquatic animals has been a concern to Southeast Asian countries for several decades (see Davy and Graham 1979, Davy and Chouinard 1983, Shariff 1987, Arthur and Shariff 1991, Arthur 1995). With the support of donor agencies such as the International Development Research Centre (Canada), the United States Agency for International Development (USAID), and the British Overseas Development Agency (ODA, now the Department for International Development (DFID), several Southeast Asian countries began to establish quarantine and/or health certification procedures for aquatic animals in the late 1970s, and at least two (Indonesia and Malaysia) have devoted considerable national resources and effort to training quarantine officers and establishing quarantine holding facilities and supporting diagnostic laboratories.

As the current status of these national efforts will be reviewed during the individual country presentations, I will not discuss these national efforts in more detail. However, I would like to explore briefly why past quarantine efforts have not been effective in preventing the international spread of serious pathogens of aquatic animals, and how the concept of "risk" and the use of "risk analysis" can lead to the application of quarantine in more effective and cost efficient ways.

Why Have Southeast Asian Countries Had Difficulties in Implementing Quarantine?

Although the concept of quarantine is relatively simple, its effective implementation can be complex, due to the need for specialized infrastructure, capability and expertise. The efforts of countries such as Indonesia in Malaysia in attempting to implement quarantine for aquatic animals are laudable, and have certainly increased national capacity to diagnose diseases of aquatic animals and provided much basic infrastructure and expertise. However, it must be admitted that these efforts have not been as effective in preventing the entry of serious exotic diseases of fish, shellfish and molluscs as hoped. There is ample documentation of the inability of national governments of Southeast Asian countries to prevent the spread of exotic pathogens, such as epizootic ulcerative syndrome (EUS) of freshwater fish, white spot

syndrome virus (WSSV) of penaeid shrimp, and more recently, koi herpes virus (KHV) of koi and common carp and Taura syndrome virus of penaeid shrimp, which are discussed elsewhere in this volume.

The inability to prevent the entry and spread of exotic diseases has been due to a number of reasons, including:

- most importantly, the lag time between when a new disease emerges, when it is first recognized as a serious pathogen of international importance, and when accurate and reliable diagnostics tests are developed and become generally available;
- the diversity of forms in which trade occurs;
- the sheer volume of commodity traded;
- the lack of simple and accurate diagnostics tests for some pathogens (e.g., white tail disease of *Macrobrachium*); and
- the limited capital and human resources that governments are able to commit to this effort.

It must also be admitted that while various multinational and bilateral donor agencies have promoted the value of establishing quarantine programs to national governments in Southeast Asia, there has, until quite recently, been little technical guidance to assist governments in designing effective policy and approaches to aquatic animal disease control. Thus in the past, national governments have had difficulty defining the scope and purpose of quarantine within national aquatic animal health programs.

The Role of Quarantine in National and Regional Biosecurity

In the past, quarantine has often been seen as a separate activity, and as a procedure that should be applied to all imports of living aquatic animals, often with the unrealistic goal of "zero risk" of disease entry to the importing country. This thinking has changed considerably in the past 10 years, so that national governments are increasingly viewing quarantine as one component of a national aquatic animal health strategy. In Southeast Asia, the components of such a national program have been defined through a regional FAO/NACA TCP project that has the support of 21 countries in the Asia-Pacific and a number of international agencies. One of the major outputs of this program was the "Asia Regional Technical Guidelines on Health Management for the Responsible Movement of Live Aquatic Animals and the Beijing Consensus and Implementation strategy" (FAO/NACA 2000). These guidelines, which outline an agreed-upon general approach and framework that countries in the Asia-Pacific should use in developing and implementing national programs to reduce the risk of pathogen transfers with live aquatic animals and their products, has been officially adopted as a policy document by the Association of South East Asian Nations (ASEAN). The guidelines act as a platform for greater cooperation and implementation of aquatic animal health management measures within the region and will be utilized in a wider context to support

the development of sustainable aquaculture in ASEAN (see http://www.aseansec.org/13553.htm).

The components of a national strategy for aquatic animal health are shown in Box 1. It can be noted that health certification and quarantine measures are key components that countries should consider when developing a national aquatic animal health strategy.

Box 1. The components of a National Strategy for Aquatic Animal Health (from FAO/NACA 2000).

- National pathogen list
- Disease diagnosis
- Health certification and quarantine measures
- Disease zoning
- Disease surveillance and reporting
- Contingency planning
- Import risk analysis
- National strategies and policy frameworks
- National and regional capacity building

In cases where a risk assessment has determined that the level of risk associated with trade in a commodity exceeds the appropriate level of protection (ALOP) of the importing country, the importing country can then consider ways to reduce the risk to an acceptable level. The possible options for risk management will vary depending on the nature of the commodity and the individual hazard. Quarantine is one of the options that may be applied (Box 2).

Note that during the risk analysis, the management options for each hazard (pathogen) must be carefully evaluated as to their likely effectiveness, and the risk presented by the hazard reassessed based on the expected results. Figure 1 shows a summary of possible risk management steps recommended by the risk assessment for hypothetical movement of live cultured juvenile fish between two countries. In this scheme initial screening for viruses, external lesions and parasites is conducted in the exporting country. Fish that pass this initial inspection are then exported and upon arrival in the importing country, they are placed in quarantine, where they are held for further observation and tested for disease. Only batches of fish that have shown no evidence of disease are released from quarantine. It is important to note that this is a working procedure for routine importation of juvenile fish, not a procedure for the introduction of an exotic species. Previous experiences with the supplier, and a good knowledge of the history of the stock and of the capabilities of the Competent Authority in the exporting country will also increase confidence in the health status of the imported animals.

Box 2. Some examples of risk management measures for importations of living aquatic animals (from Arthur *et al.* 2004).

- Sourcing from stocks of known disease status, including the use of specific pathogen free (SPF) stocks
- Importing eggs only
- Requiring quarantine and inspection in the country of origin
- Requiring quarantine and testing within the receiving country
- Using International Council for the Exploration of the Sea (ICES) protocols
- Requiring the use of specific diagnostic tests and standards
- Requiring preshipment and/or postshipment treatments

The Basic Requirements of Effective Quarantine

The basic requirements for effective quarantine include:

- Adequate physical infrastructure appropriate to the level of containment required (secure facilities, secure intake water source, etc.);
- Established operating protocols (including chain of custody); and
- Well-trained staff.

Detailed information on the requirements for setting up and operating quarantine facilities for exotic species and for routine ornamental fish trade are given by MAFF (2001), AQIS (2003) and Arthur (2003).

The necessary supporting services for quarantine include:

- Adequate legislation;
- Effective enforcement (e.g., border customs and inspection, postborder follow up);
- Knowledgeable and supportive aquaculture industry;
- Sufficient political will;
- Competent and readily available diagnostics support;
- Existence of reliable diagnostics tests for major pathogens;
- Good working relationships between importing and exporting country Competent Authorities;
- Good knowledge base of pathogens present in importing country (surveillance and monitoring, disease surveys); and
- Good information base on pathogen biology, prevention, treatment, etc.

Conclusions

Consideration of quarantine is a fundamental activity when setting up a National Aquatic Animal Health Strategy. Quarantine may be highly important to some countries having significant aquaculture, capture fisheries and/or natural biodiversity. In other cases, national situations may make quarantine a low priority or an unnecessary activity.

For most country situations, quarantine need not be applied generally. Whether or not to require quarantine should be determined based on the results of a risk analysis for each commodity or situation. In some cases, risk analysis may show that quarantine of a given commodity is not required to achieve the national ALOP, while in others, less costly and/or less restrictive measures may be equally effective.

The responsibility for establishing a quarantine facility (e.g., whether private sector or government), the place of quarantine (preborder or border) and the stringency of quarantine (level of security, duration, testing, etc.) should also be decided on a case by case basis based on the nature of the importation. Importations of exotic species for aquaculture development, because of the high likelihood of introducing serious pathogens and the extensive economic, biological and social damage such pathogens may cause,

will require more stringent quarantine measures than, for example, routine importations of strictly ornamental species.

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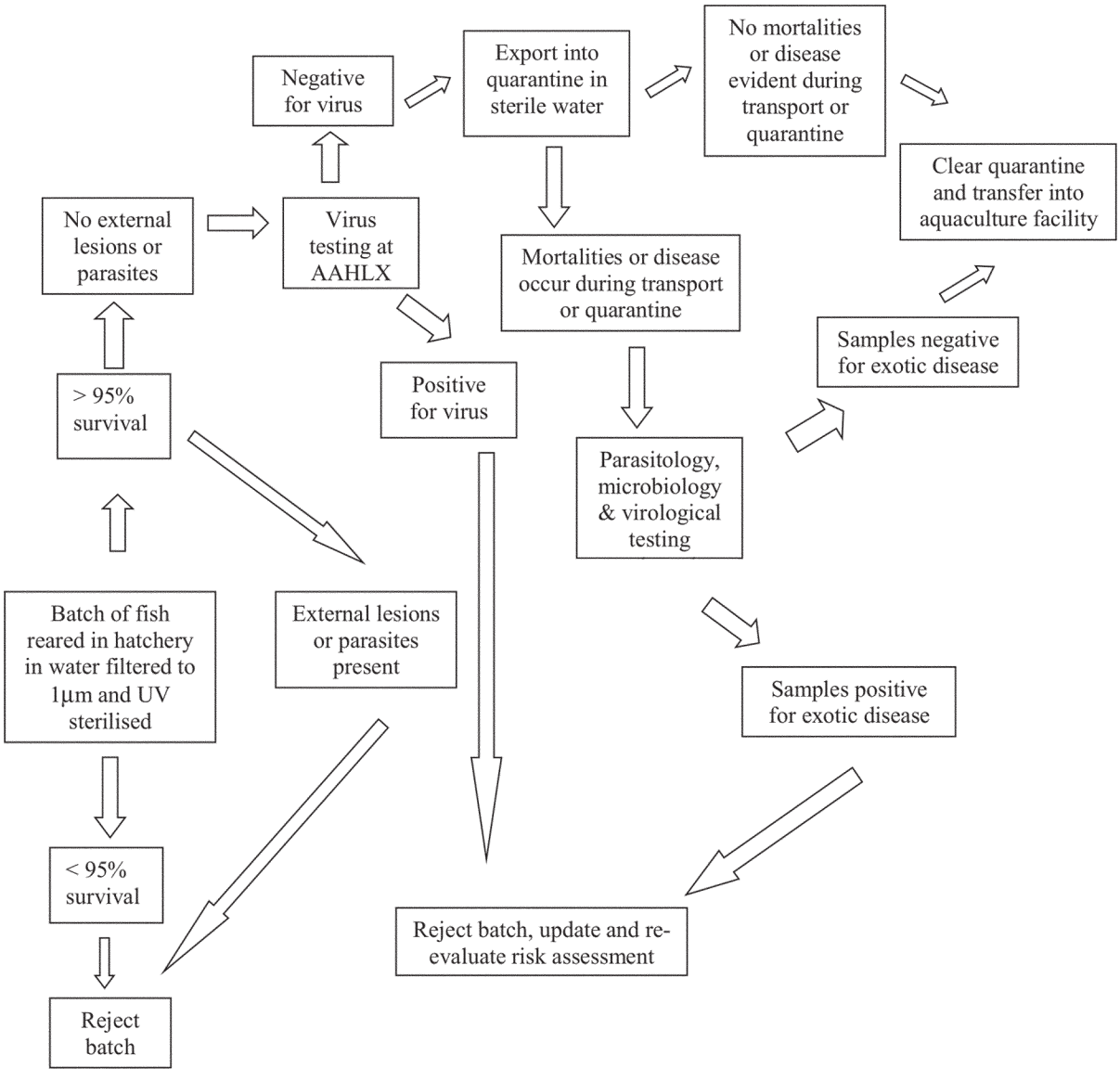

Fig. 1. Summary of the risk management steps recommended by a risk assessment for movement of live cultured juvenile fish from Country X to Country Y. (AAHLX = Aquatic Animal Health Laboratory, Country X) (from Arthur *et al.* 2004).