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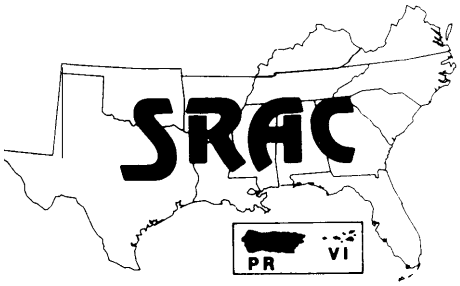

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Introduction of Exotic Shrimp

Quarantine and Disease Inspection Methods

Sterling K. Johnson*

Introduction of exotic animals provides some degree of both benefit and risk. The risks of exotic shrimp introduction include the possible establishment of a disease in domestic or wild shrimp stocks. Suitable management approaches must be considered. If a disease is suspected but not clearly established because of the lack of research, it is best to consider some precautions. For intercontinental transfer of exotics, control methods that focus on avoidance are most common.

Approaches to disease avoidance

Some avoidance approaches are as follows:

1. No introductions.
2. Inspection at source.
3. Inspection upon entry.
4. Quarantine methods.
5. Introduction of stock known to be clean.

No introductions would mean no risks, but would also mean no benefit from introduced species. Inspection at the source is considered by the Food and Agriculture Organization of the United Nations and many others to be the only practical basis of an international program for disease control in aquatic animals. Some nations or state regulations concerning fish transfer require that farms pass inspections over a course of months or years and follow established culture guidelines to qualify as an import or export facility. These rules normally relate to salmonid fishes, a group whose risks are much better established than the diseases associated with shrimps.

The United States Department of Agriculture, The U.S. Department of the Interior, and most comparable agencies of other countries, insist on documentation of source inspection. If unavailable at port of entry or exit, the agency is authorized to seize, quarantine or destroy. The U.S. Department of Interior adds another layer of regulation. The Lacey Act, as amended in 1981, consolidates laws concerning transportation of wildlife, including animals used in aquaculture. In essence the agency assures that those engaging in international commerce of living stock will submit to either domestic or foreign laws concerning introduction. Noncompliance involves a criminal penalty.

Anyone importing exotic shrimp should have the following at the time of customs check:

- Certificate of origin
- Health certificate
- Invoice
- Valid import/export permit (U.S. Fish & Wildlife Service)
- If entry into a non-designated port: A port exemption permit (USFWS).

Inspection at entry maybe the only practical choice if facilities or expertise are unavailable for a suitable inspection at the source. Inspections could take place anywhere along the line of transfer from source to destination (Figure 1).

Quarantine

The quarantine method reduces the disease potential by the isolation of hosts. The disease agent is not allowed to pass unchecked into a culture system, where it could rapidly increase its numbers. If newly arrived stock is placed in quarantine, a disease maybe recognized after a

* The Texas A&M University System.

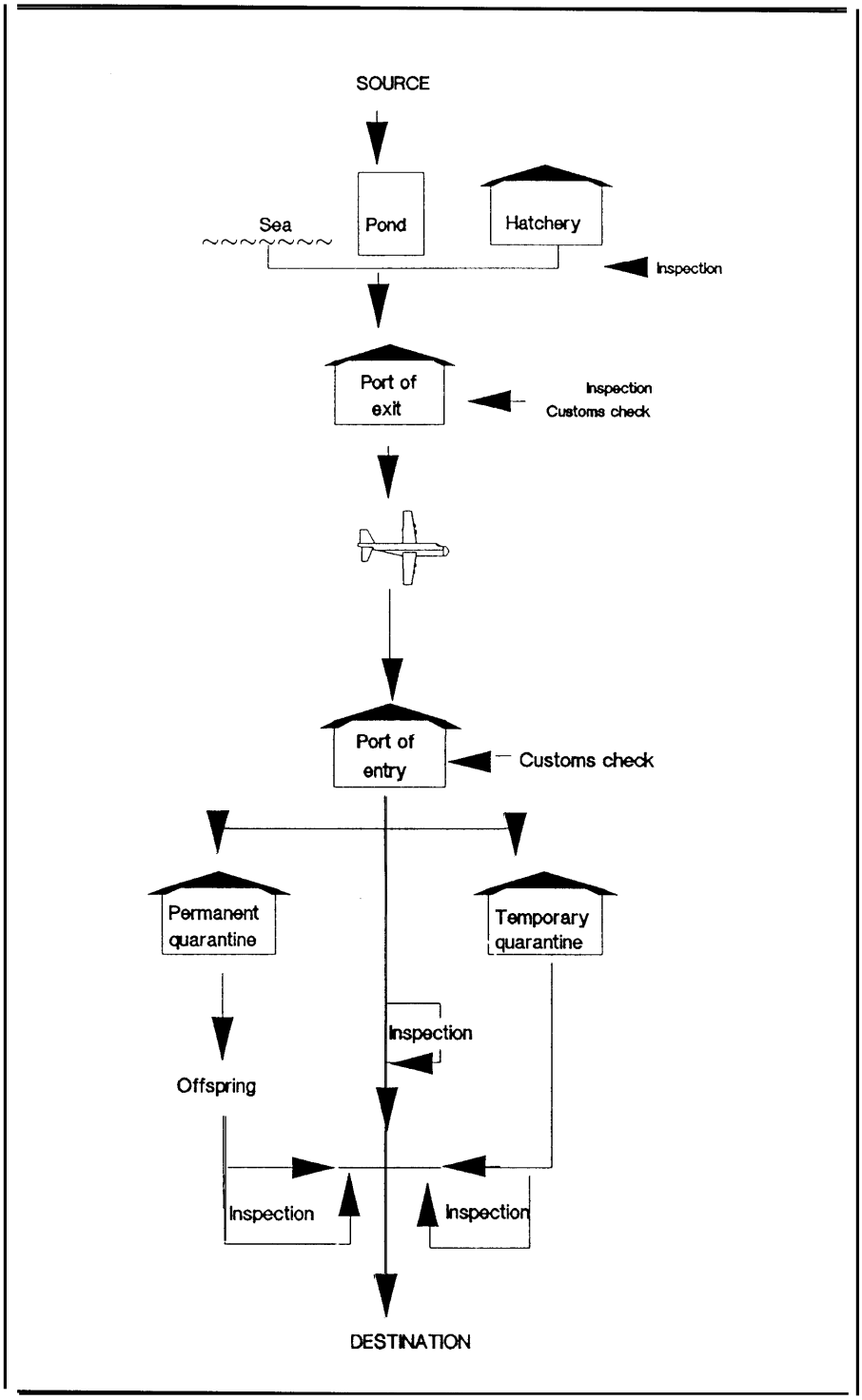

Figure 1. Flow routes for exotic shrimp introductions, showing points of inspection and quarantine.

suitable incubation period. Disease suppression may be enhanced when quarantine is used in combination with a parasite treatment. Most aquaculture facilities have some form of quarantine either in the structural or management plan.

Quarantine can provide a useful environment for "faltering out" diseases in new stocks, if bona fide cures are available. Unfortunately post-treatment checks of individuals in large aquatic animal populations are generally not practical, and few cures are known for important shrimp diseases.

Quarantines are sometimes used as a means to avoid a particular disease agent. Such a concept often emerges as a regulatory effort to establish a "disease free" or "pathogen free" (i.e., "virus free") status of imports. It is true that the quarantine technique is a means for disease avoidance, but there is a great deal of difference between disease and pathogen presence.

Regular source inspection is the best approach. As practiced in aquaculture, quarantine is a displaced simulation of a source inspection process. Its effectiveness is limited and a strong measure of impracticality is added.

A common error is the belief that "someone" is developing a population that is verifiably pathogen free. Such a process would require cultivation of several generations, in strict isolation from the natural environment (water source, other animals, etc.). The initial parent stock would best come from a verifiably pathogen free geographical area. Due to lack of necessary studies, "clean" geographical areas are only remote possibilities.

Inspection

Inspection may be used to form a working record of disease/pathogen presence or as a basis for decisions regarding the immediate fate of a stock. The procedure is helpful when any transfer of stock takes place, but it is particularly important in the transfer of stock from one global area to another. The basic concerns regarding disease transfer by exotics (usually defined as from a foreign country) is the risk of introduction of a disease to (1) native animals or plants or (2) uninfected aquaculture stocks.

The characteristics of a particular disease influence the decision to include it in an inspection process. Living disease agents that gain most attention are **infectious** (those capable of entering the shrimp and

multiplying), **contagious** (spreading rapidly between shrimps) and **obligate** (existing only in relationship with shrimp).

Non-infectious causes of disease are generally not considered. Most of these are abiotic and not geographically unique.

Parasites with the potential to affect condition or threaten human health should be screened. Living agents are not normally associated with disease, but accompanying shipments (stowaways) should be carefully considered.

Disease agents of particular interest are shrimp viruses. They require shrimp for completion of their life cycles, and some are thought capable of causing epizootics in intensive aquaculture conditions. Viruses recorded in Western Hemisphere shrimps, which are known to cause kills in hatcheries and nurseries, are the infectious hypodermal and hematopoietic necrosis virus (IHHN) and *Baculovirus pennaei.*

Other obligate agents would include the other shrimp viruses, haplosporidia, microsporidia, gregarines, worms, isopods and other parasites. Most of these are considered undesirable but not possessing acute epizootic potential.

The inspection process may include a variety of methods. Many are applicable in the small laboratory normally present on a shrimp farm. Others require assistance from a diagnostic laboratory.

Inspection is a means of disease control which may or may not have regulatory implications. “Unofficial” inspection is a tool of considerable benefit in general aquaculture management.

Inspection may involve both agent detection and disease diagnosis. Disease diagnosis is what is often implied when regulations are formulated that state “disease free.” A disease diagnosis defines the disease condition and forecasts the consequence of its presence. The disease may be infectious or merely a result of agents attacking a temporarily weakened stock. The disease could be noninfectious such as shipment stress. If a 20 percent mortality occurred without involvement of a biotic agent, how would one call it? Expect that the 80 percent would likely recover in post-shipment? Inspectors should have experience in diagnostics.

Investigation of shrimp disease is still a relatively new endeavor. The importance of specific disease agents is not clearly defined. It is easy to overstate or understate the importance of any of the presently known shrimp diseases. This uncertainty in risk assessment makes regulatory control choices difficult or even premature. To some degree, regulatory shrimp disease inspection is in a holding pattern until our knowledge base advances to a more mature stage.

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