Chapter I

Hazard Control for Aquaculture Shrimp Products

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Shrimp aquaculture industry has an excellent record for the production of safe products of consistent quality. However, as aquaculture production expands, the industry and regulatory agencies is alert to factors which can impact on the public health safety of aquaculture products. Specific problems which may be encountered in shrimp aquaculture products include:

- contamination by bacterial and viral pathogens *e.g.* Salmonella, *Vibrio cholerae*.
- presence of veterinary drugs (and other substances) which may have potentially hazardous effects on consumers, handlers, and the environment.
- residues of aquaculture chemicals or other environmental contaminants.

Under the surveillance program for aquacultured shrimp conducted by the Department of Fisheries, the HACCP concept is being applied into all operations, including the production and handling of raw materials, processing operations, the processing environment, handling and storage practices, and distribution activities. This approach minimizes the reliance on analytical tests and reduces the need for comprehensive inspection of finished aquaculture products and can identify and dealt with hazards before they create an impact on processors and consumers. Hazards in aquacultured shrimp include microbiological hazards as well as chemical hazards associated with the inappropriate use of drugs and chemicals in aquaculture.

The Department of Fisheries together with the aquaculture industry and processing industry jointly developed preventative approaches to assure control over raw materials, the manufacturing process, the production environment, and personnel. It is based on the identification of potential hazards, applying of control measures at CCPs (critical control points), and the monitoring and verifying of CCPs; thereby enabling the assurance of food safety during aquaculture and processing.

Shrimp Aquaculture in Thailand

Raw material quality control units located in 22 major shrimp culture areas; the unit concentrated on aquaculture shrimp quality monitoring at production sites

INTRODUCTION

Techniques such as surveillance and inspection of final products do little to assure the safety of the food supply. The hazard analysis critical control point system (HACCP) enables aquaculturists and processors to exercise control over food safety. HACCP is essentially a technique based upon anticipation and prevention of food safety hazards and it may be applied throughout the food chain from producer through to final consumer, leading to enhanced food safety and better use of resources.

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HACCP PRINCIPLES

1. Conduct hazard analysis, identify hazards and specify control measures.
2. Identify critical control points (CCP).
3. Establish critical limits at each CCP.
4. Establish monitoring procedures.
5. Establish corrective action procedures.
6. Establish verification procedures.
7. Establish documentation procedures.

This chapter will review the use of HACCP concept to prevent impact on product safety. Some examples will be elaborated.

HACCP PRINCIPLES

The HACCP system consists of seven principles which outline how to establish, implement, and maintain a HACCP Plan. The HACCP principles have been published by the Codex Alimentarius Commission and have gained international acceptance.

The implementation of the HACCP system requires technical expertise and entails a systematic study of all operations, processing, packaging, storage, distribution, and subsequent handling by the consumer. When HACCP is applied at an early stage it will result in significantly reduced food safety risks.

1. Conduct Hazard Analysis

Potential hazards in aquaculture must be identified, hence all activities associated with production, harvesting, processing, storage, distribution, and marketing of aquaculture products must be evaluated. This includes a review of:

- the use of antibiotics, drugs and other veterinary chemicals.
- potential sources and specific points of bacterial and parasitic contamination during production and processing.
- the potential for microorganisms to survive or multiply in aquaculture products.
- the risks and the severity of all hazards identified.

Furthermore, it is necessary to establish whether:

- pathogenic microorganisms/toxins may be present in raw materials.
- pathogens may contaminate aquaculture products after harvest.
- aquaculture products will be held warm, chilled, frozen, or at ambient temperatures.

An important aid to hazard analysis is the process flow chart which documents all the major steps in an aquaculture operation. Process flow charts may take many forms, with some incorporating symbols to indicate sources of contamination, CCPs, inspection activities, etc.

The next step is to identify all the hazards which could occur at each stage and to describe preventative measures for their control. The severity of hazards and the probability of their occurrence is also evaluated according to epidemiological data about the foodstuff.

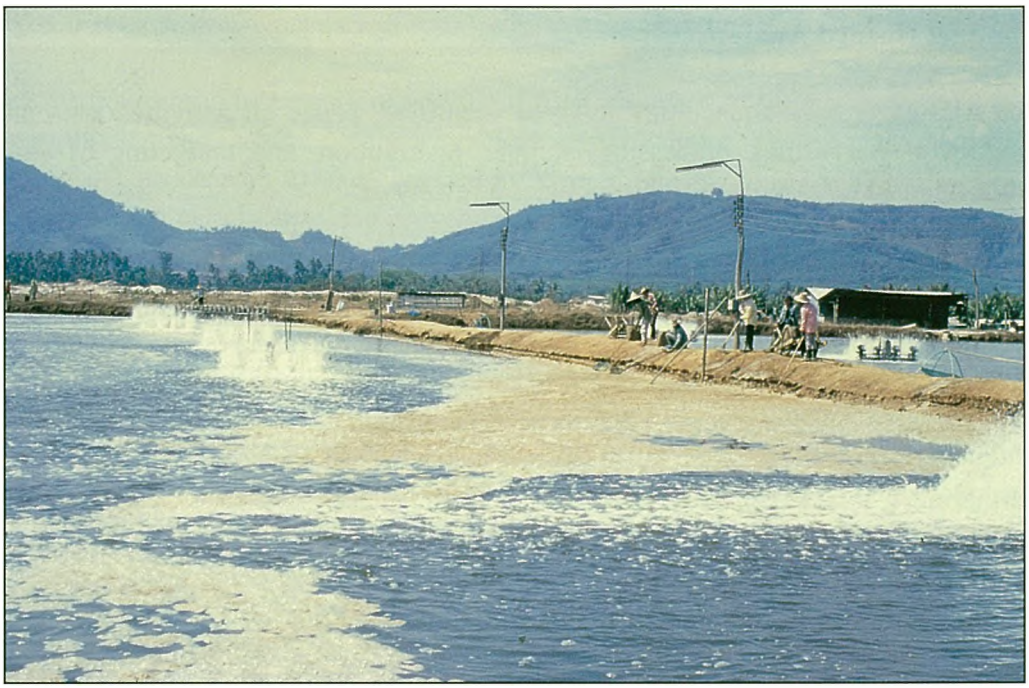
Hazard analysis is a vital component of the HACCP system. It requires a good knowledge of aquaculture operations, access to technical literature and epidemiological data, and a sound knowledge of the production environment (achieved by observation and discussion with farmers or workers).

2. Identify Critical Control Points (CCP)

The CCP is unique to the HACCP system, as all preventative and control measures are aimed at hazards which have been identified during the hazard analysis step. A CCP must be identified for each hazard.

To be a CCP, an operation must be such that appropriate action will prevent, control, or minimize the hazard. Cooking shrimps will control risks associated with contamination by food poisoning bacteria. Potential contamination of the shrimp pond environment may be minimized by using dry pelleted feeds (rather than using fresh manure) or controlling farm hygiene.

To aid in deciding what operations are CCPs, a decision tree has been developed as shown in *Figure 1*. The decision tree contains a logical series of questions which are asked for each hazard at each processing step. The answer to each question leads the HACCP team to a decision whether or not a procesing step is a CCP.



3. Establish Critical Limits for Each CCP

The most important phase in the establishment of a HACCP system is translating CCP information into surveillance procedures which can be used in the production and processing environment.

Critical limits define the boundaries between safe and unsafe products (and practices), hence they must be associated with a factor which can be measured and monitored on a routine basis.

This involves defining product and process variables and their tolerances at each CCP. For example, application of drug or chemical during the growing period could be a CCP, with critical limit include the use of approved drug and chemical and drug MRL. Other examples of critical limits include pesticide MRL, allowable levels of heavy metals, chlorine levels, minimum particle size for filth, storage temperatures for chilled products, concentration and dipping time for metabisulphite dips, etc.

Information for determining critical limits may be drawn from published information, expert advice, experimental data, and mathematical modelling.

Microbiological specifications should be avoided as the test results are not available for several days. HACCP is based on the ability to take instant action when the process deviates, so microbiological analysis is typically used only for verification purposes. Where rapid microbiological methods are available they may be used for monitoring CCP, however they need to be truly rapid (minutes rather than hours).

4. Establish Monitoring Procedures

If HACCP is to function effectively, a regular schedule for monitoring each CCP must be

established. Monitoring should be undertaken by persons involved in the operation, and involve making observations, taking measurements, and testing of samples. When establishing the monitoring program it is necessary to:

- carefully establish the frequency of testing *i.e.* daily, once per shift, continuous, etc.
- ensure sampling is based on statistical sampling plans.
- document suitable monitoring methods.
- assign staff to take responsibility for monitoring and recording of results.

Monitoring activities must provide rapid results, so the appropriate corrective action may be promptly implemented. Therefore, measurement of pH, salinity, time, temperature, physical and chemical parameters are favoured over lengthy and complex determinations such as microbiological analysis.

5. Establish Corrective Action Procedures

When monitoring indicates deviation from the specified range (critical limits) immediate action must be taken to rectify the situation and get the process back under control.

Under HACCP, corrective action is clearly defined beforehand so the person knows how to respond to any process deviations. This includes advice on how to correct the problem and bring the process back under control, and guidance on isolating all affected product. All suspect product should be placed on hold until it can be tested to assess its safety. There is also the need to implement action to review the process and the corrective action in order to prevent a recurrence of the deviation and the hazard. Examples of corrective actions in aquaculture practices includes extending of withdrawal period or thorough washing of harvested shrimp.

6. Establish Verification Procedures

The HACCP system should be audited to assess whether it complies with the documented HACCP plan. This verification process assists in improving the HACCP system and determines whether the HACCP system achieves its goals. The types of questions which may be asked during the verification process include:

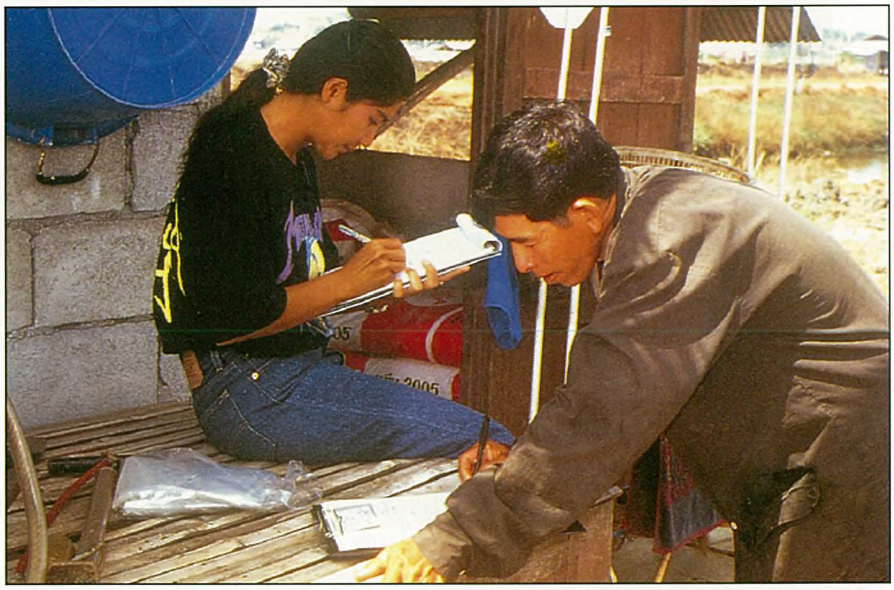
- Have the correct CCP(s) been selected?

- Have effective criteria for control been specified?
- Are control measures in place?
- Are the monitoring activities effective?

Verification may also involve a thorough review of documentation as well as examination of all microbiological, chemical, and physical test data to ensure production operations are fully controlled.

HACCP systems are in a constant state of evolution, so the verification process assists in fine tuning the system to improve its effectiveness. It is important to stress that any change in production or processing operations requires a complete reassessment of the HACCP system because the hazards may have changed and this necessitates a review of the critical control points.

7. Establish Documentation Procedures



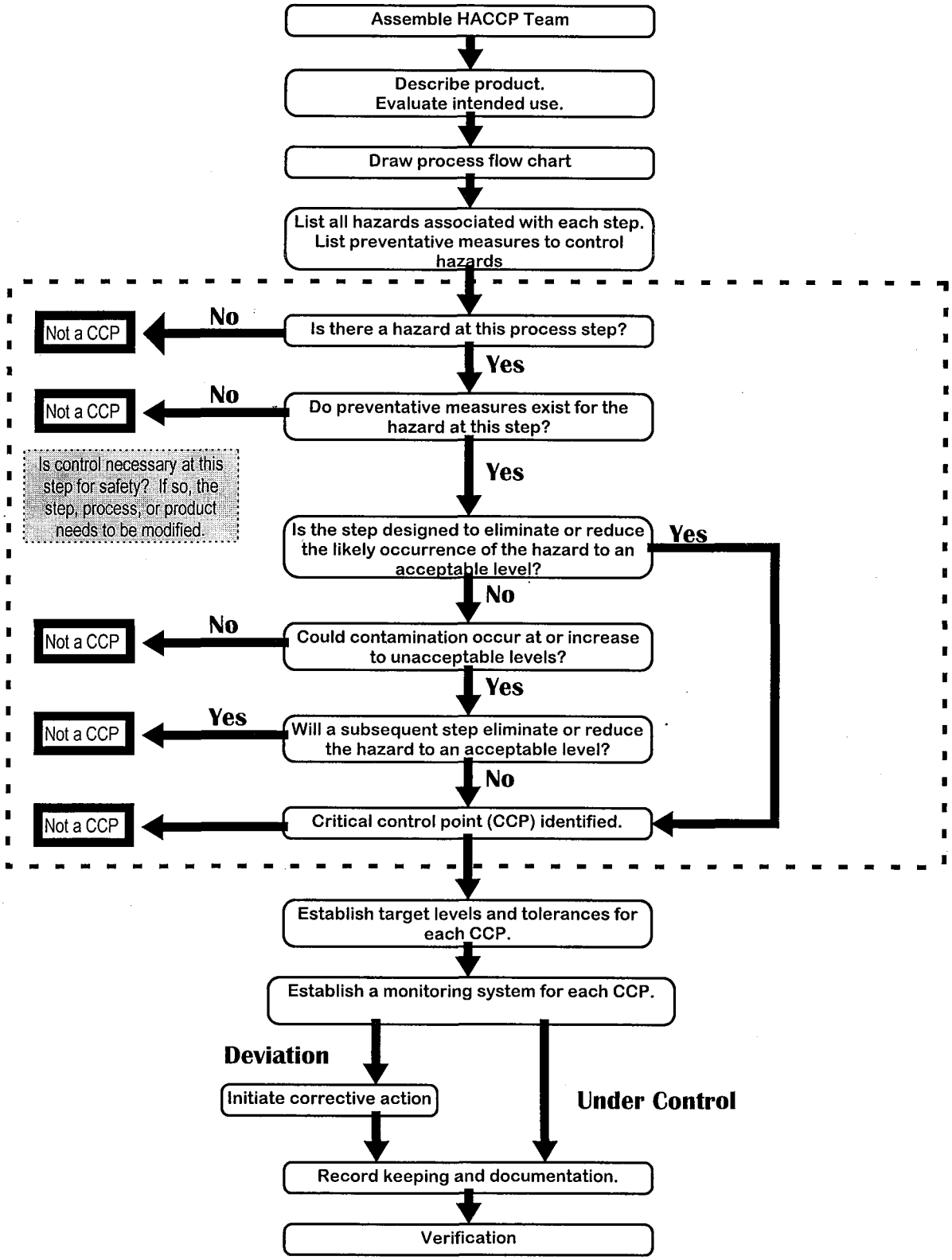
Under HACCP, aquaculturists must maintain records of all CCP monitoring activities, including records of raw materials (fry, feed, water sources, chemical and drug), production data, and monitoring activities. The collection and collation of this data assists in carrying out verification activities, as well as in trouble shooting to determine the cause of production problems, data analysis for production improvements, and to review production history where products have been the subject of customer complaints or action by regulatory agencies.

The application of the HACCP technique commences with the formation of a HACCP team whose task is to oversee the development, implementation, and maintenance of the HACCP system. *Figure 1* documents the various stages in the process, which integrates steps **1** to **7** above, in a logical sequence.

APPLICATION OF HACCP TO AQUACULTURE

CODEX Committee on food hygiene recommended the steps for HACCP application as appear in *Figure 1*.

Figure 1: The CCP Decision Tree



A HACCP team

THE HACCP TEAM

HACCP is normally implemented by a multidisciplinary team of people (the HACCP team).

Members of the team should be drawn from personnel having knowledge and experience in the following areas: HACCP, quality assurance, aquaculture production or processing, and engineering. Personnel in the team must have a real working knowledge of what happens in aquaculture production and be able to analyse and interpret data.

Each team must have a HACCP expert who understands the principles of HACCP and can effectively communicate the concepts to all staff. While many staff will find HACCP a difficult and complicated system, the role of the expert will be to train staff about HACCP and its common sense approach to managing food safety. Training is an important element of HACCP, and the team should receive training to develop their level of technical expertize.

AQUACULTURE PRODUCTS DESCRIPTION

The first task of developing a HACCP Plan is to describe the species.

Black tiger shrimp (*Peneaus monodon*), cultured for three months in an earth pond, wet and pellet feed are given. Water was changed continually, throughout culture period.

Antibiotics or chemicals may be used to treat shrimp at larvae stage or when shrimp was found infected. Drugs may be added in the feed or applied directly.

Shrimp is harvested manually; harvested shrimp was put in ice with in 15 minutes after caught; it is then sorted and packed in ice and transport to processing factory.

PROCESS FLOW CHART

Process flow chart for shrimp production is shown in *Figure 2.*

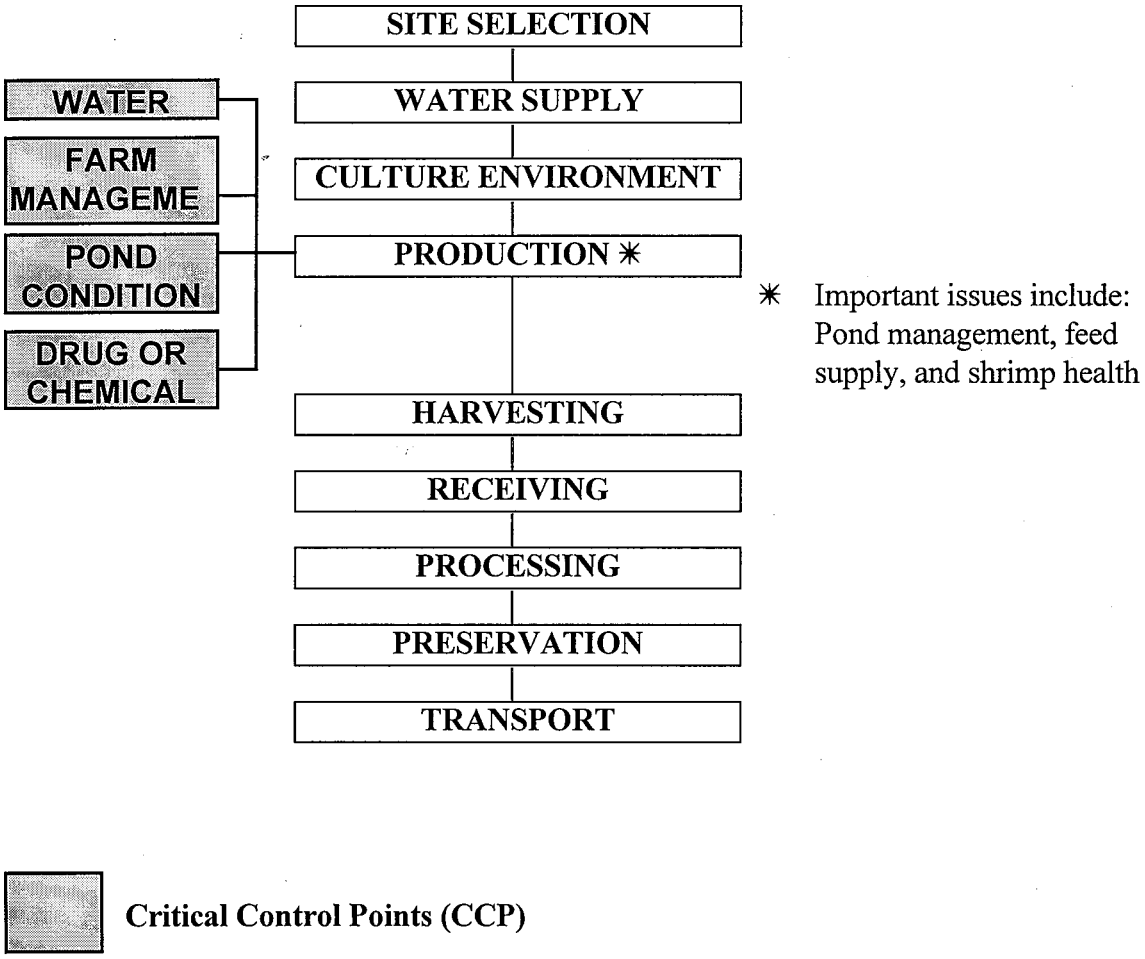


Figure 2: Generic Aquaculture Process Flow Chart

HAZARD ANALYSIS

A hazard is defined as a biological, chemical, or physical agent with the potential to cause an adverse health effect. The first stage in the HACCP process is to conduct a comprehensive hazard analysis of the food (aquaculture product) relative to its intended end-use, including a review of raw materials, ingredients, production and processing operations, consumer usage, etc. The HACCP team must determine the type and range of hazards that may be encountered during the production and processing of an aquaculture product. This process may be assisted by describing the product, evaluating its intended use, and preparing a process flow chart which describes the steps in producing and processing the product. The flow chart may alert the team to the opportunity for contamination or product abuse at different stages in the production chain.

Potential hazards in aquaculture may be identified as biological hazards, chemical, and physical hazards. Hazards can enter an aquaculture product at any time during production and processing *e.g.* occur as a result of using pesticide contaminated feed; inappropriate use of veterinary chemicals; pollution of the aquaculture environment by pathogenic bacteria or viruses; contamination during the processing of aquaculture products, etc. *Table 1* explores some of the types of hazards that may be encountered.

Hazard analysis were conducted. Specific hazards which may be encountered in shrimp aquaculture products are shown in *Table 1*:

Table 1: Hazards Associated With Aquaculture Products

CATEGORY	EXAMPLES OF HAZARDS	
Biological hazards	Pathogenic bacteria	Salmonella, Shigella, *E.coli*, *Vibrio cholerae*, *V.parahaemolyticus*, *V.vulnificus*, *Aeromonas hydrophila*, *Listeria monocytogenes*, etc
	Parasites and Protozoa	Larva of parasites such as trematodes, cestodes, or nematodes. *e.g. Clonorchis sinensis*, *Anisakis* sp., *Capillaria philippinensis*, etc
	Viruses	Hepatitis A, Norwalk virus, etc
	Mycotoxins	Aflatoxins
Chemical hazards	Veterinary residues	Hormones, growth regulators, antibiotics
	Pesticide residues	Herbicides, fungicides, insecticides, etc
	Heavy metals	Mercury, lead, cadmium, copper, etc
Physical hazards	Glass, wood, metal, etc	

The microbiological safety of aquaculture products has been the subject of much research in recent years. It is largely accepted that the microbiological quality of the production environment, impacts on the microbiological quality of the fish and ultimately the processed

product. This is no more apparent than with molluscan shellfish, as they have been implicated in numerous outbreaks of foodborne disease. They represent a threat to human health when they are consumed raw, hence there is need for control over production, harvesting, processing, and distribution.

On the other hand, aquaculture production of finfish and crawfish has not presented a major health hazard for consumers in the United States (NOAA, 1991). Literature on the potential hazards from Salmonella and Vibrio species in the framing of shrimp is conflicting. Salmonella and *Vibrio cholerae* were found to be present as part of the natural flora of brackish cultured shrimp, and pose a major concern for processors and exporters (Reilly and Twiddy, 1992). In contrast, Salmonella was not recovered from shrimps or shrimp ponds in a recently completed study in Thailand (Dalsgaard *et al.*, 1995).

Clearly, the aquaculture production of finfish, crustaceans, and molluscs may present a threat to public health if they are not grown and harvested under strictly hygienic conditions. Once harvested, aquaculture species are at risk from contamination in the processing plant with a wide range of pathogenic bacteria derived from the processing environment, water used in processing, equipment, and food handlers. The HACCP team needs to review the scientific literature to identify potential hazards and to quantify the risks.

At this stage the HACCP team will need to prepare a simple process flow chart to assist in identifying the steps where hazards are introduced or become a potential problem. The process flow chart is therefor an important aid to hazard analysis, documenting all the major steps in an aquaculture operation. *Figure 2* is a generic model for commercial aquaculture production. It would need to be tailored to meet the needs of specific aquaculture operations *i.e.* shrimp production, catfish farming, etc.

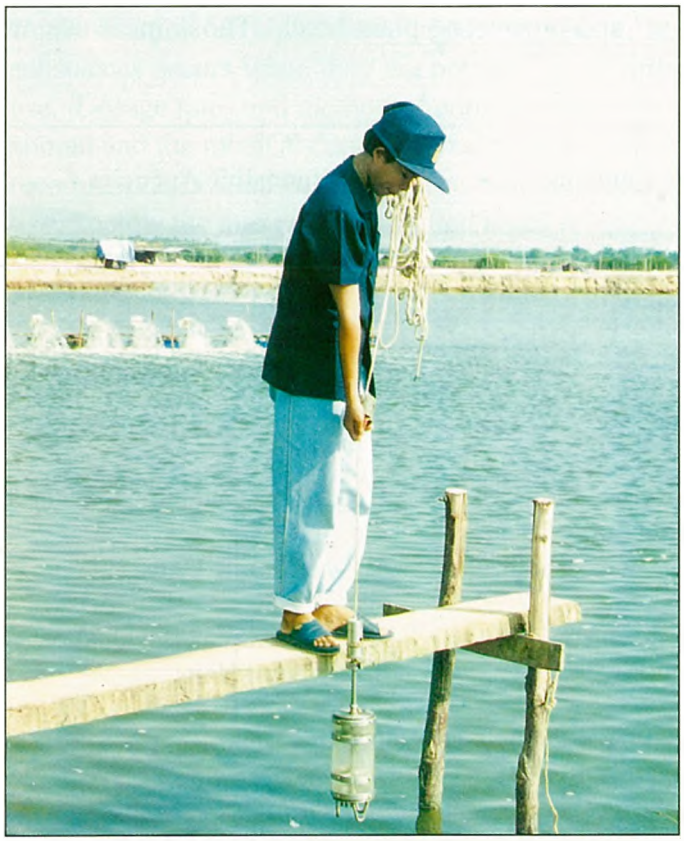
The HACCP team must identify all known hazards, nominate the step(s) in the process flow chart where each hazard may occur, and describe preventative measures for their control. This stage requires much thought and often expert assistance in determining what are the real hazards. Increasingly risk analysis techniques are being applied to this step, to ensure that the hazards are sufficiently real. For example the team needs to review:

- use of antibiotics, drugs and veterinary chemicals.
- potential sources of bacterial and parasitic contamination.
- potential for microorganisms to survive or grow in aquaculture products.

Table 2: Hazard Analysis For Shrimp Aquaculture Production

PRODUCTION STEP	HAZARD	SEVERITY	RISK	SIGNIFI-CANT Yes/No	CONTROL AT
SITE SELECTION	chemical contamination microbiological contamination	medium/ high	low/ medium	yes	prerequisite control
GROWING • pond condition	chemical contamination microbiological contamination			yes	prerequisite control by good farming practices
• water supply	Salmonella	high	medium	yes	CCP
• feed/fertilizer	Salmonella	high	medium	yes	CCP
• uses of chemical and drugs					CCP
HARVESTING	Salmonella re-contamination	high	medium	yes	CCP
	Glass, wood	high	medium	yes	CCP

Site Selection



Growing Period

Harvesting

PREVENTIVE MEASURES DEVELOPED

Recognizing that the control at aquaculture level are not an easy task, the Department of Fisheries, therefore, since 1991, has taken several measures to control the above identified hazards which could be harmful to consumers and caused rejection from importing countries.

The preventive measures, based on HACCP preventive control concepts, were developed specifically to prevent drug and chemical residue in aquaculture products and to prevent

microbiological contamination at farm level and processing plant level. Those measures are outlined as follows:

Potential Critical Control Points	Preventive Controls	Responsible Agencies
Farm management	• farm registration • farm sanitation and practices	• Coastal Aquaculture Division
Feed production	• feed control	• Feed Control Division
Farming practices	• control uses of vet. drug • monitor quality of water, antibiotic residue, shrimp disease • monitoring residue in raw material	• Coastal Aquaculture Division • 18 Mobile Units • 22 Raw material Quality Control Units
Processing plants	• control sanitation hygiene, processing practices at processing establishment • inspection of finished products	• Fish Inspection and Quality control Division • 6 Fish Inspection centers

IDENTIFICATION OF CRITICAL CONTROL POINTS (CCPs)

CCPs relate to specific processing steps where a hazard can be controlled. CCPs can be found by using knowledge of the process and all the possible hazards to decide on the best preventative measures for their control. The decision tree in *Figure 1* can be used to assist in deciding what operations are a CCP, however many HACCP teams find it rather complicated.

A major concern in aquaculture relates to the use of veterinary substances such as antibiotics, drugs, anesthetics, and growth promotants. If drug residues above the MRL are considered a hazard, the decision tree would be used to determine the critical control point as in *Table 2.*

Therefore, the production (growing) step is a Critical Control Point for misuse of registered chemicals such as drugs. Accordingly, the HACCP team must now examine the preventative measures that need to be put in place to avoid such a hazard occurring, and to develop monitoring methods to ensure correct procedures are adhered to.

The use of drugs is especially important, as relatively few drugs have been approved for use in aquaculture. Hence a number of drugs are being used without approval. Clearly this is illegal and raises many difficulties especially when aquaculture products enter foreign markets.

Contamination of aquaculture products with excess levels (exceeding MRLs) of approved substances occurs when they are not used in accordance with instructions for safe and effective use. Dosage rates and method of administration with vary depending on the type and age of the animal and the medical condition being treated. The aquaculture producer must then follow the recommended withdrawal period, to enable the animal to metabolically reduce the drug level in tissue below the maximum permitted level.

Table 2: Decision Tree

STEP HAZARD	DECISION TREE QUESTION	PROCESS STEP (from flow chart): PRODUCTION
GROWING DRUG RESIDUE	1. Is there a hazard at this production step? (GROWING - 4 MONTHS)	YES (drug residue exceeds MRL)
	2. Do preventative measures exist for the identified hazard?	YES (use approved drug at correct dosage)
	3. Is the step specifically designed to eliminate or reduce the likely occurrence of the hazard to an acceptable level?	NO (a growing period is design to grow shrimp to marketable size)
	4. Could contamination occur at or increase to unacceptable levels?	YES (during growing period, the drug may be added in feed or directly applied)
	5. Will a subsequent step or action eliminate or reduce the hazard to an acceptable level?	NO (drug or chemical can not be removed by any processing method)

HACCP PLAN

The following HACCP plan were developed by a HACCP team consisted of:

- Aquaculture technologists
- Processing plants quality control personnel
- Food technologists
- HACCP specialist

The plan is developed based on the work conducted under the ASEAN-Canada Fisheries Post-Harvest Technology Project - Phase II, to be used as generic model for further development.

REFERENCE:

Mahony, 1995. HACCP in Aquaculture: Papers prepared for PAEC/DOF Seminar on Quality Assurance for Aquaculture Products. Queen Sirikit National Convention Centre, Bangkok

Major Activities of Raw Material Quality Control Unit

- Mobile units
- Water quality testing
- Drug residue determination (HPLC and Microassay)

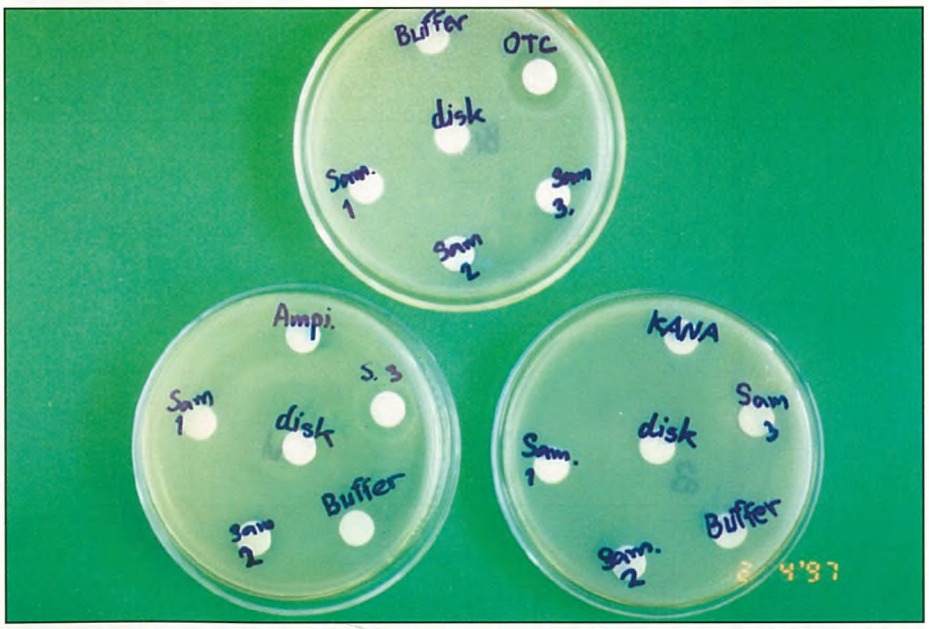
Raw Material Unit

Mobile Unit

Water Quality Testing

Drug Residue Determination (HPLC)

Drug residue Determination (Microassay)



HACCP PLAN FOR AQUACULTURED SHRIMP

AQUACULTURE FARM_____ DATE:_____ PAGE NO.:_____

Critical Operation	Hazard	Control measures	Monitoring Procedure	Recorded	Monitoring Frequency	Specifications	Person Responsible	Corrective Action
A production or processing operation as described in the process flow chart.	Identify what can go wrong at this critical operation.	What variables associated with this critical operation must be controlled to prevent or minimize the hazard?	List methods used to monitor the variables listed under CCP. (Usually a documented procedure).	Indicate where the results are recorded.	List the frequency of monitoring activities.	List maximum and minimum values for each variable monitored.	Nominate who is responsible for the monitoring activity.	What action is to be taken if the CCP deviates from the permitted range? Who is responsible for correcting the situation? Who must be notified?
e.g. preparing ponds, loading water, stocking fries, feeding shrimp, treating shrimp with antibiotics, harvesting and packaging, etc.	*e.g.* Salmonella *or* other micro organism contamination, drug residue exceeding MRL, etc.	*e.g.* Drug dosage, hygiene, temperature during shrimp storage, etc.	*e.g.* Core temperature using thermometer, pH meter, data logger, visual assessment, rapid test for drug and chemical residue etc.	*e.g.* Log for raw material uses, production record log, etc.	*e.g.* Every week, day or hour, etc.	*e.g.* Nil tolerance of foreign matter, MRL for drugs, -18°C ± 1°C, etc.	*e.g.* Farm worker, technician, etc.	**Corrective action must:** • correct the problem • isolate product • determine cause.

HACCP PLAN FOR AQUACULTURED SHRIMP

AQUACULTURE FARM_____ DATE:_____ PAGE NO.:_____

Critical Operation	Hazard	Control measures	Monitoring Procedure	Recorded	Monitoring Frequency	Specifications	Person Responsible	Corrective Action
Water used in aquaculture	Contaminated water : Pathogenic bacteria Pesticides	Farm hygiene control In-coming water quality In-coming water treatment pond	Farm hygiene inspection Monitor water quality Monitor pesticide level in nearby water sources (obtain information from govt. monitoring program)	Farm log book ■ farm hygiene record ■ water quality record	Every week Fortnightly Fortnightly	Acceptable according to farm hygiene rating scale (Department of Fisheries, Thailand) Pathogenic bacteria - not detected MRL pesticide	Farm technician or trained worker	Correct deficiencies identified If water contains high bacterial count or pathogenic bacteria, increase frequency of monitoring during grow out period Re-evaluate the source of water Retain water at longer period in treatment pond before use Farm workers should report to farm manager

HACCP PLAN FOR AQUACULTURED SHRIMP

AQUACULTURE FARM_____ DATE:_____ PAGE NO.:_____

Critical Operation	Hazard	Control measures	Monitoring Procedure	Recorded	Monitoring Frequency	Specifications	Person Responsible	Corrective Action
Farm management	Contaminated feed, fry, shrimp diseases	Farming practices Stock density	Monitor water physical quality Monitor disease	Farm log book water quality record	Every week Fortnightly	CODEX Guidelines water quality for aquaculture Acceptable - DOF Farm Rating Scale	Farm manger or trained worker	Treat disease appropriately in consultation with fish pathologist Farm workers should report to farm manager
Drug chemical residue	Use of un-approved drug or chemical Residue exceeding acceptable level	Identify appropriate application level of drug or chemical used in farm Appropriate withdrawal period applied	Review record of drug application Screening check using appropriate test kits	Drug application record	Every week throughout growth period	Oxytetracycline 0.5 ppm Others: no tolerance Withdrawal period 21 days	Trained worker	Apply appropriate withdrawal period Mark lot of raw material for further verification Send raw material for residue check-up 14 days before harvesting

DEPARTMENT OF FISHERIES
FARM INSPECTION RATING REPORT

Farm Name _____ Location _____

Date _____ Inspector _____

ITEMS	RATING				COMMENTS
	VG	G	F	NI	
1. GENERAL CONDITION 1.1 Land based establishment 1.1.1 Located on a hygienic water source 1.1.2 Sited at safe distance from housing and/or factories 1.1.3 Site protected from flooding 1.1.4 Soil for construction meets heavy metal and/or other chemical limits 1.2 Water based establishment 1.2.1 Located on a hygienic water source 1.2.2 Sited at safe distance from housing and/or factories 1.2.3 Site is protected from waterborne traffic 1.2.4 Good circulation of water					
2. LAYOUT AND CONSTRUCTION 2.1 Site has separate area and a proper hygienic operation for: a) Hatchery b) Feed storage c) Sizing and packing 2.2 Site access can be controlled 2.3 Floors - in good repair, clean, properly sloped, water proof and non-absorbent (where appropriate), without crevices and easy to clean 2.4 Walls - smooth, in good repair, light coloured, clean, water proof, non-absorbent (where appropriate) and without crevices 2.5 Ceiling - smooth, in good repair and easy to clean 2.6 Drains - smooth and impervious, and of sufficient capacity					

VG - VERY GOOD, G - GOOD, F - FAIR, NI - NEED IMPROVEMENT

ITEMS	RATING				COMMENTS
	V	G	F	NI	
3. WATER USED IN AQUCULTURE 3.1 Appropriate quality for rearing, treated properly before use 3.2 Microbiological quality meets prescribed limit 3.3 Properly treated before draining					
4. HYGIENE REQUIREMENTS 4.1 Water/ice used with product 4.1.1 Microbiological quality meets prescribed limit 4.1.2 Contains suitable residual chlorine 4.2 Toilets 4.2.1 Located at safe distance from areas where rearing, feed storage and packing are done 4.3 Cleanliness 4.3.1 Handwashing facilities are provided 4.3.2 There is hygienic removal of waste matters 4.4 Waste and offal 4.4.1 Containers with lids are provided 4.4.2 Containers are frequently removed from areas 4.5 Pest control 4.5.1 A program to control birds, rodents and other animals is in place					
5. EQUIPMENT AND UTENSILS 5.1 Made of approved material 5.2 Properly designed to facilitate cleaning and disinfection					

ITEMS	RATING				COMMENTS
	V	G	F	NI	
6. FARM PRACTICES 6.1 GENERAL CLEANLINESS 6.1.1 Area is kept clean 6.1.2 Equipment and utensils are washed before using 6.1.3 Utensils are proper stored 6.2 Rearing and Handling 6.2.1 Records are kept and maintained for: a) Water and uses of water b) Feed and feeding c) Diseases and their control d) Drugs and chemicals, indicating: i) A list of drugs and chemicals used ii) A record of time(s) / amount(s) used iii) A record of withdrawal period(s) 6.2.2 Proper harvesting techniques are used 6.2.3 The product is washed with hygienic quality water 6.2.4 The product is at a temperature close to melting ice 6.2.5 Efforts are made to prevent contamination during harvesting, sorting and transporting 6.2.6 Delays during handling is kept to a minimum.					

Overall rating :

Comments :

Inspector :	Verified by :